THE AEROPLANE and ASTRONAUTICS

FEBRUARY 5, 1960

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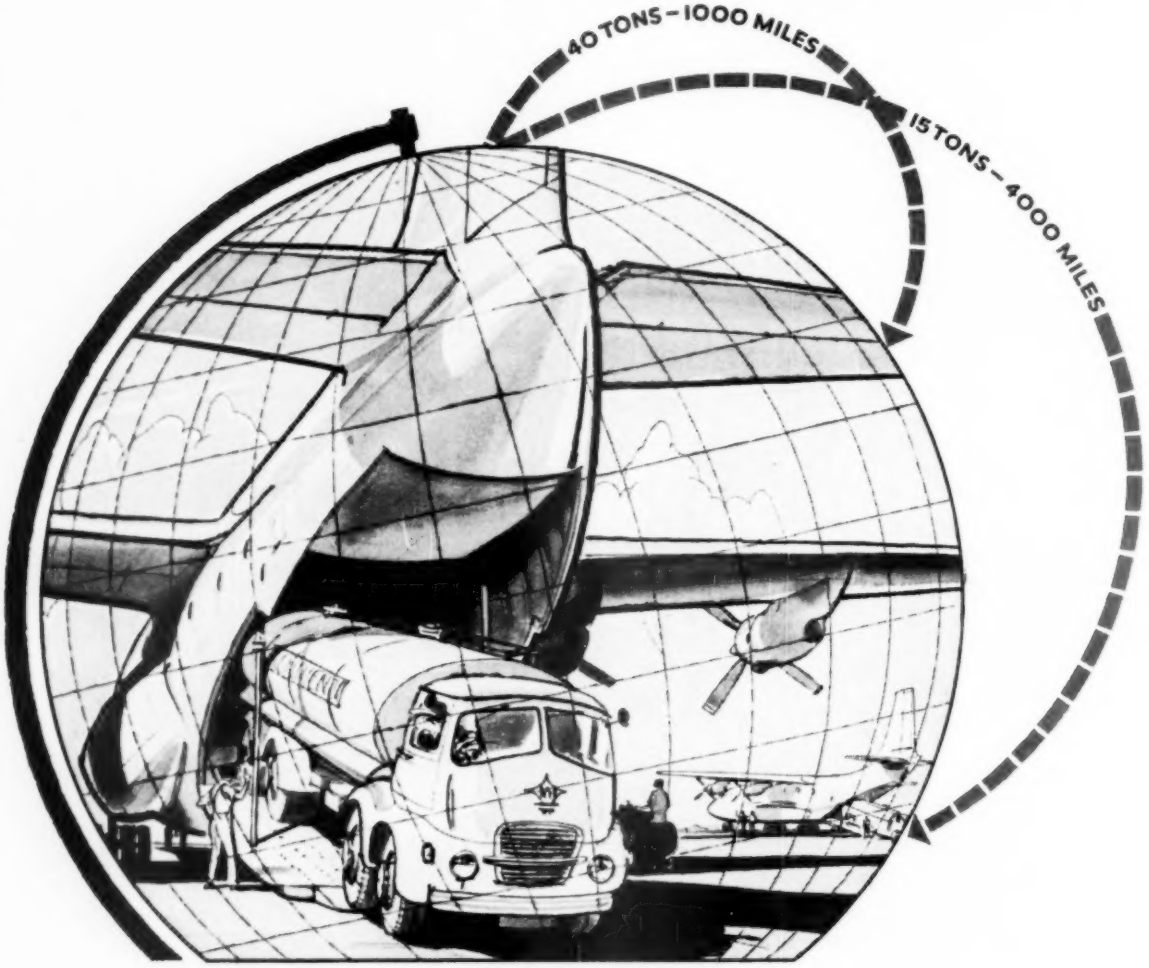

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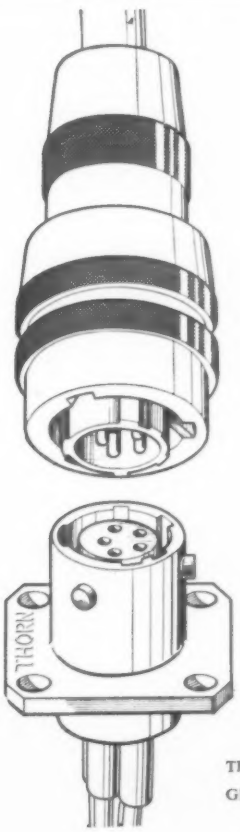

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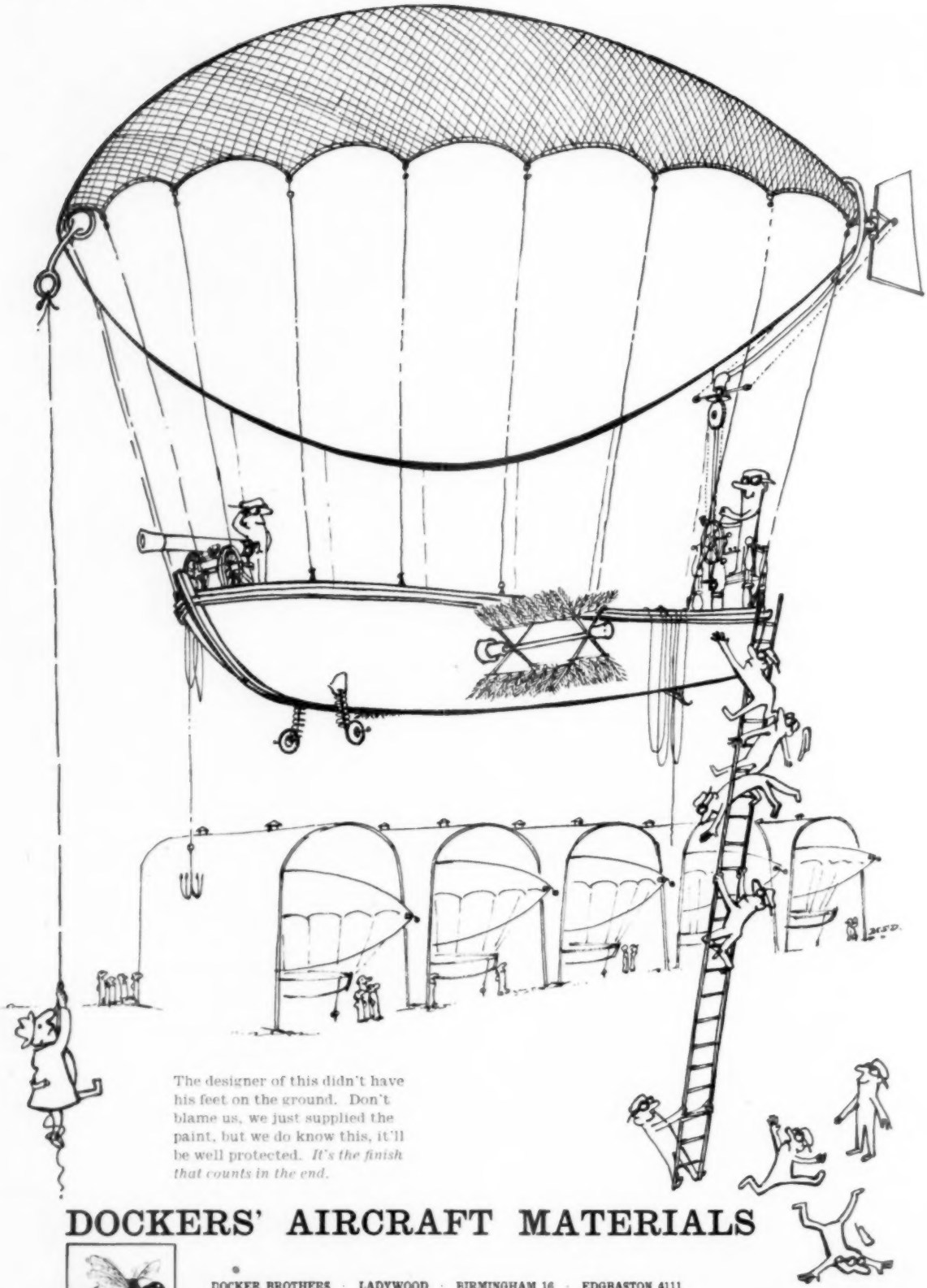

The designer of this didn't have his feet on the ground. Don't blame us, we just supplied the paint, but we do know this, it'll be well protected. *It's the finish that counts in the end.*

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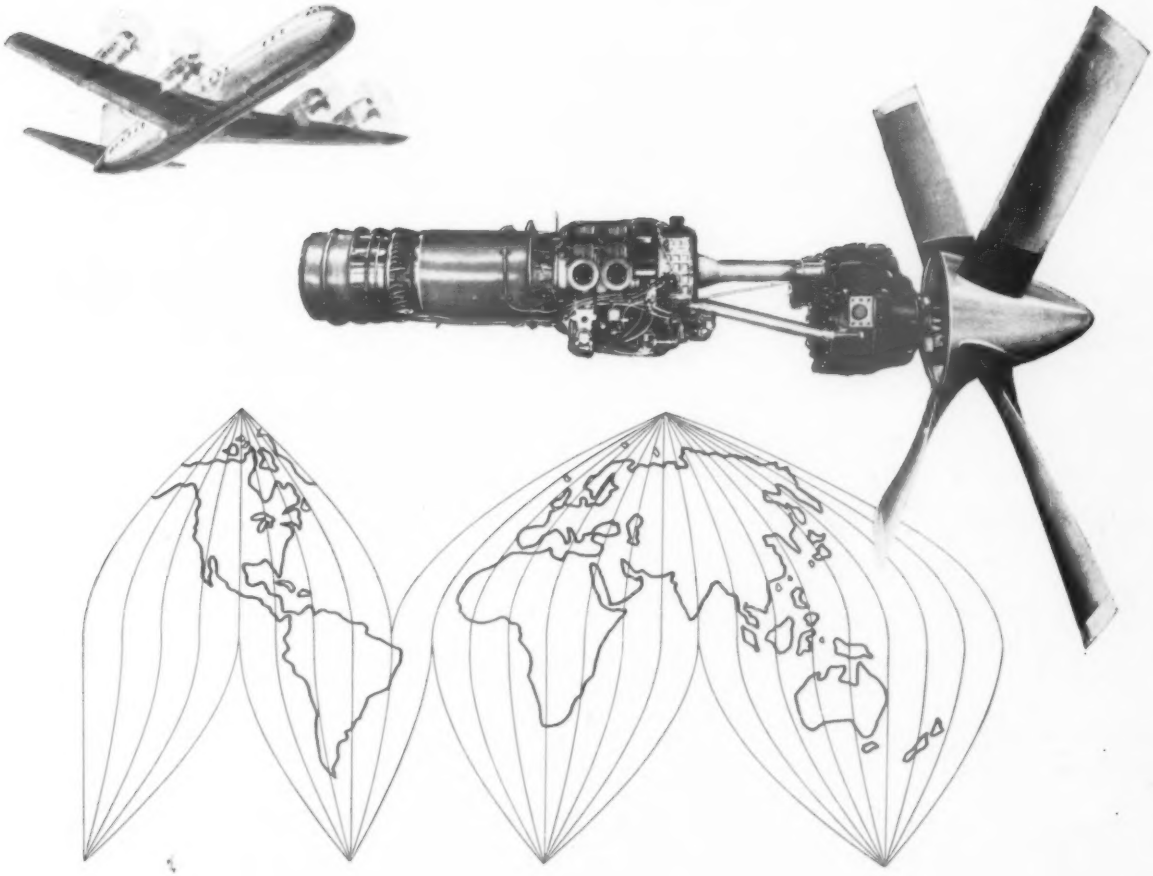

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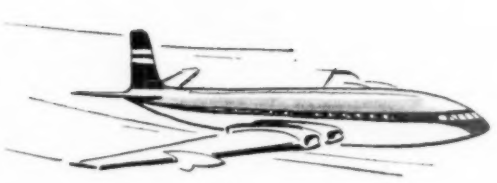
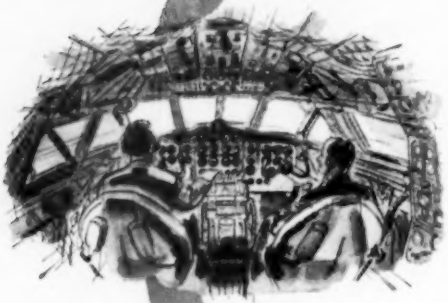
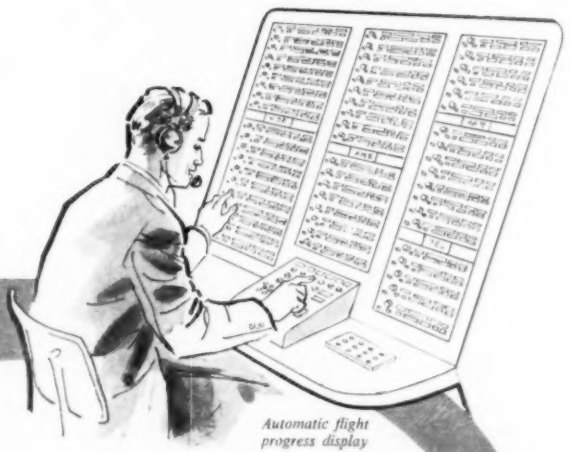




Preparing air traffic control for the Jet age:

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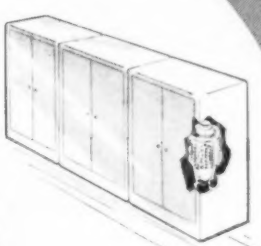

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THE AEROPLANE and ASTRONAUTICS

VOLUME 98 NUMBER 2520 FEBRUARY 5, 1960

Bursting Out All Over

Pictures of the squarely robust Currie Wot which we publish this week exemplify the thrusting, striving efforts which are being put into the light aeroplane business all over this country. The particular effort in which the Wot is involved is not a culmination but a first step; indeed no prime mover can be regarded as suitable for an aeronautical powerplant until it has accumulated thousands of flying hours.

This explains the importance of the many attempts now being made in this country to get light aeroplanes into the air, whether for what Mr. Masefield thinks should be called "General Aviation," or for military training purposes. Only aeroplanes which are flying this year can be expected to be available for sale next year. Meantime, the inflow of imported foreign aeroplanes continues remorselessly. And so it should. Until British producers get around to meeting the demand, it is right that the demand for executive aircraft should be met by the enterprise of the importing agents.

We wonder whether foreign makes will be allowed to enter for the round-England air rallies now being planned for the summer. The sight of vintage aircraft trundling after each other year after year to win a Royal Trophy has begun to pall. A rally with imported thoroughbreds might ginger up things quite a lot.

But apart from the novel powerplant in the Currie Wot we have yet to hear of any work being done on a new British engine for light aeroplanes. It seems that we shall have to rely on building foreign designs under licence.

What a come down!

Can Mr. Kremer's Prize Be Won?

Has the Royal Aeronautical Society, with the help of the Royal Aero Club, put the magnificent Kremer prize of £5,000 out of reach of the enthusiasts who are striving to achieve manpowered flight? Study of the Rules, published in this issue, suggests that they may well have done so.

The winner (or winning team) have to achieve an unaided start and make a figure-of-eight circuit around two markers, 880 yards apart, at a height of not less than 10 ft. Obviously, the total distance flown will vary according to the tightness of turns achieved. It seems fairly safe to assume that no one is going to risk tight turns at this stage of the art, so the winner may well have to cover two miles.

In a most interesting paper held over for a later issue, Mr. Shenstone estimates that the optimum cruising speed will be about 30 m.p.h. This is on the basis that the crew will be able to keep up pedalling for 10 minutes at least. What Mr. Shenstone did not study at length was take-off power. It could be that the crew will exhaust themselves pedalling (or rowing) their aircraft into the air.

As the latest thinking indicates that the accelerating thrust will have to be obtained from wheels rather than an airscrew, it seems a pity that the R.Ae.S. has forbidden the use of a launching trolley. This is something that the motorless flight experts have been using for years.

We wonder, too, how much the necessary insurance premiums are going to cost. It is hard to imagine much third-party damage being done on a windless aerodrome by a machine weighing a few hundred pounds.

In our view the rules are calculated to produce a really worthwhile machine. But it may take years to develop it.

Has the prize been put too far out of reach?

C

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Matters of Moment

The B.O.A.C. 707 Hold-up

LAST week's news of a delay in the issue of a British certificate of airworthiness for B.O.A.C.'s 707-436s may be considered as the first public evidence of a struggle to obtain the safest possible handling characteristics for this 707 variant. For every advance in aircraft performance a price has had to be paid in the mastering of new techniques by the pilot, and the 707, with its big jump in speed and loadings, has certainly been no exception. Pilots of these "mostest" aeroplanes have had to learn a lot of new tricks—and to do so whilst being in control of the £2-million transport which requires the tricks to be learned.

That the techniques can be mastered and the difficulties overcome has been shown by the good service record of the Boeing during the past 15 months—but the severity of the difficulties has equally been demonstrated by the poor accident/incident record during the conversion training programmes. The question of relative airworthiness appears to revolve around the characteristics of this aircraft as a medium for training and conversion rather than those of a transport aeroplane in scheduled service while in the hands of a competent and fully trained crew. Most of the training incidents and accidents have resulted from demonstration of the 707's Dutch-roll behaviour and from misjudgments during the final approach and flare-out phases.

The combined yawing and rolling motion which is described by the term "Dutch roll" has been at least a latent characteristic of all high-speed, swept-wing jet aircraft. To relieve the pilot of the need for constant attention (and the passengers from discomfort) automatic correcting devices are used to damp out the oscillation before it develops. The 707 has an electronic yaw damper which senses and corrects sideslip.

Because of the increased rudder loads which this damper introduces, it cannot be used during take-off and initial climb, or during the approach and landing. Unfortunately it is at lower speeds in the circuit, and at high altitudes, that Dutch roll is liable to become rather more than just a nuisance. Hence the need during training to demonstrate the characteristic, to allow the oscillations to build up and to practise the accurate application of rudder or aileron, or a combination of the two.

The Dutch-roll tendency will have special importance in any case of engine failure. Such a failure is not easily recognized at once with a turbojet aeroplane, and the more vigorous directional corrective measures, applied later, can run a pilot into trouble.

Another "different" feature of any big jet aeroplane is that the application of power will not blast it quickly out of the stall. If the 707's speed is allowed to fall off too far and the nose is raised too quickly after recovery there is likely to be a severe secondary stall.

Pilots explain that much greater care and concentration is needed in the circuit with the 707 than with earlier "conventional" transport aeroplanes, and accurate speed-control is essential. The approach is flat and very little stick force is needed for the flare-out. There is a risk of undershooting if the pilot retains any intrained expectation that the aeroplane will, after being aimed at the threshold, float on to the runway. It has to be "flown," and the wings kept level, until it is quite firmly on the ground—and while it is on the ground during the later part of the take-off run.

The fore-and-aft attitude during this run is also somewhat critical and take-off distances are increased if rotation is started too early, or if an exaggerated nose-up attitude is maintained. The fitting of leading-edge flaps (before the 707 entered service) considerably reduced the runway-distance penalties suffered in such mishandling, but the take-off performance can still be seriously impaired by severe mishandling of this kind.

Remembering experience with the early Comet, B.O.A.C. and the Air Registration Board were particularly concerned about take-off performance and behaviour, and tail-drag take-off tests were made early last autumn at Edwards Air Force Base with the first 707-436 for the Corporation. A steel plate was fitted to the aft part of the under-fuselage and successive mishandled take-offs were made and the results were measured.

So much for the information available and the impressions which have been gained by the outsider. What is the present position in relation to the modifications necessary to satisfy the A.R.B.?

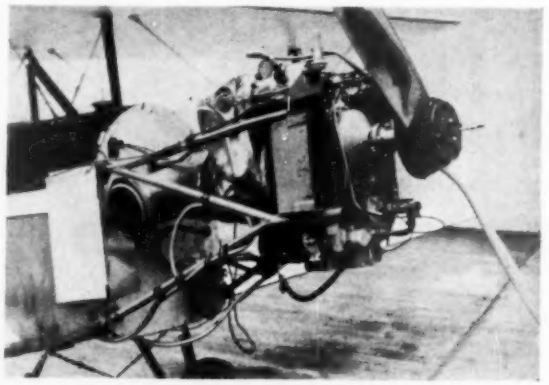
A 707-120 has been flying at Seattle for some time with certain modifications which have been incorporated partly in the ordinary course of Boeing development work and partly to meet A.R.B. requirements. Two 707-436s for B.O.A.C. have flown, both are now being modified and the first may be airborne again by the time this appears in print.

The new features include, it is understood, rudder boost over the whole range of movement to overcome the reduction in the effectiveness of the tab after engine failure and consequent yaw (previous 707s have had rudder boost for large angles of displacement); the fitting of a slave or "redundant" yaw damper; a 35-inch vertical increase in fin area; and the addition of a small ventral fin with bumper to limit the maximum angle of rotation during take-off.

Ejection Seats for America

A SPARES provisioning team from the Aviation Supply Office of the U.S. Navy is at present visiting the Martin-Baker Aircraft Co., Ltd., factory at Denham. The visit, to determine the range and number of spares to be carried for the company's Mk. 5 fully automatic ejection seats which are now standard equipment for U.S. Navy aircraft, is the first to a contractors works outside North America in the history of the Aviation Supply Office.

The compilation of the spares schedules for the nine types of seat, fitted to the Grumman F9F-8T Cougar trainer, Chance Vought F8U-1 and 2 Crusader, McDonnell F4H Phantom, Lockheed T2V-1 Seastar, McDonnell F3H Demon, North American FJ-4B Fury, Douglas F4D Skyray, Grumman F11F Tiger and the Grumman F9F-8B Cougar is expected to be completed by today. Future production orders for the seats fitted to new types of aircraft will probably be dealt with by similar visits by a provisioning team.



HOTTER WOT.—A 60 s.h.p. Rover 1S/60 gas-turbine has been installed in a Currie Wot to test the potential of this ground or air A.P.U. as a prime mover. Initial flying trials will be done with an ultra-fine-pitch airscrew by Vivian Bellamy, C.F.I. of the Hampshire Aero Club.

Photographs copyright "The Aeroplane and Astronautics"

British Enterprise in Mexico

FIFTY years ago, in the early morning of January 8, 1910, Sr. Alberto Braniff (still very much alive in Mexico) the young scion of a wealthy Mexican family—staggered into the air in a Voisin biplane (60 h.p. ENV) which he had brought over from France after the Voisin brothers had taught him how to get it off the ground.

Today, Don Alberto laughingly admits he was a bit behind the Wright brothers but he thinks he was probably the first to un-stick at 7,640 ft. above sea-level—which is Mexico City's aeronautical handicap.

Fifty years later, on January 8, 1960, the President of the Republic, Lic. Adolfo López Mâteos opened an Aero Show in Mexico City's Airport to mark this event. It remained open a fortnight.

Leaving airline exhibits out of it, Britain, Italy and the United States took part in various ways. There were 26 exhibitors in the static displays with eight exhibits in the outside show of which five were U.S. personal or executive aircraft.

One of the most prominent exhibits was the Hawker Siddeley presentation at the stand of their agents, Duncan y Cossio, S.A., who also presented the products of Fairey Aviation, Cossor Radar and Redifon.

After Prince Bernhard of the Netherlands had visited the Show the Rt. Hon. George Ward, M.P., the British Secretary of State for Air, arrived by air in a Comet II of Transport Command.

With appropriate timing the first Comet IV C for Cia Mexicana de Aviacon landed at Mexico City Airport bringing the leading men of the buyer operators. Messrs. Dunlop, Errington, Wilson and Young, of de Havillands, were on the delivery flight.

The U.S.A.F. sent a Globemaster and three Voodoo F.101s for occasional aerobatic displays—so popular with the Mexican public.

Mr. Voisin, the surviving brother who helped to build Sr. Braniff's machine, also came in from France.

Everyone who is anybody in Mexican civil and military aviation has attended the Exhibition. The public were passing the Hawker Siddeley exhibit and presentation of the Avro 748 at the rate of about 1,000 per hour, which is a measure of public interest.

Looking at exhibits at the Mexico City Air Show with the Hon. George Ward, British Air Minister (second from left), are left to right Alex Duncan; Ing. Acuña Ongay, Mexican Director of Civil Aviation; Jerry Heyland, Sir Andrew Noble, Bt., H. M. Ambassador to Mexico.

Aviation Awards for 1959

EVERY year round about this time there comes welcome news of the award of medals and trophies to some of those individuals and organizations who have distinguished themselves in various branches of aviation during the past 12 months. Two such announcements were made last week by the Guild of Air Pilots and Air Navigators and by the Royal Aero Club.

From GAPAN came the news that the 1959 Johnston Memorial Trophy has been awarded to the Decca Navigator Co., Ltd. In its citation, the Guild refers to the development of the Decca Navigational System, incorporating the Decca flight log "which has provided a great contribution to aerial navigation over medium-distance routes, and the first practical pictorial presentation of an aircraft's ground position to be used in civil aircraft. After many years of satisfactory use, the system has shown itself capable of solving some of the problems of air traffic control in congested areas, whilst its long-distance equivalent, Dectra, has been impressively demonstrated on long-distance flights across the North Atlantic. . . ."

The Cumberbatch Trophy goes to Mr. James Martin, C.B.E., M.I.Mech.E., F.R.Ae.S., designer of the Martin-Baker ejection seat which, the Guild records, has been adopted by the Air Forces of approximately 40 nations, and up to date has helped to save the lives of nearly 350 military pilots and civil test pilots. "Mr. Martin," the citation adds, "has strenuously developed the ejection seat to cope with the increasing demand of faster aircraft. . . . In awarding the Cumberbatch Trophy to Mr. Martin the Guild expresses on behalf of all those whose lives he has helped to save their warm appreciation of his contribution to air safety."

The 1959 Derry and Richards Memorial Medal has been awarded by the Guild to Mr. A. W. Bedford, A.F.C., A.R.Ae.S., chief test pilot of Hawker Aircraft, Ltd. The citation refers to his outstanding work in bringing the various Marks of Hunter aircraft up to their present stage of development and his work on the spinning characteristics of the Hunter.

GAPAN's Award of Merit goes to Wg. Cdr. C. E. F. Arthur, A.F.C., director of Universal Flying Services, Ltd., and chief flying instructor of Fair Oaks Aero Club, for his services in flying instruction.

The Royal Aero Club has awarded its Silver Medal to Major T. W. "Dumbo" Willans for his pioneering contribution to British sporting parachuting and in recognition of his gallantry and skill in testing the first barometric parachute opening device and the Folland lightweight ejector seat.

No. 111 Sqn. of the Royal Air Force have been awarded the 1959 Britannia Trophy for their brilliant aerobatic displays throughout the year. And the Geoffrey de Havilland Trophy goes to Sqn. Ldr. R. Gellatly for the 100-km. closed-circuit speed record for Class E rotorplanes in the Fairey Rotodyne.

£3 Million Exports Weekly

AVIATION exports in 1959 were a record for the fifth consecutive year; totalling £156,056,066, they averaged £3 million a week. In giving these figures last week, the S.B.A.C. said that since the War aeronautical exports have totalled £942 million; nearly £600 million in the past five years.

Although it is likely that exports will fall off in the future, a good number of orders was received in 1959. These included Comets for Greece and Mexico, Britannias for Argentina and Canada, Canberras for Sweden, Sea Hawks for India, Bloodhound SAMs for Australia and Seacat SAMs for Sweden. Viscount orders were also placed by six more customers.

HONOURED.—L. to. R., James Martin (Cumberbatch Trophy); Sqn. Ldr. R. Gellatly (Geoffrey de Havilland Trophy); Major T. W. "Dumbo" Willans (R.Ae.C. Silver Medal).

£5,000 for Manpowered Flight—The Rules

A prize of £5,000 was offered in November, 1959, by Mr. Henry Kremer for a successful controlled flight of a Man Powered Aircraft designed, built and flown within the British Commonwealth under conditions to be laid down by the Man Powered Aircraft Group of the Royal Aeronautical Society. The Royal Aero Club will act as official observers.

The Regulations and Conditions governing the award, which is to be known as the Kremer Competition, have now been laid down by the Royal Aeronautical Society and are as follows.

This Competition shall be conducted by the Royal Aero Club of the United Kingdom under the Regulations and Conditions laid down by a Committee called the KREMER COMPETITION COMMITTEE, which shall be composed of members of the Royal Aeronautical Society and of the Royal Aero Club. The Kremer Competition Committee is hereinafter referred to as "The Committee."

The Aircraft will be considered as Gliders and no Permit to Fly or Certificate of Airworthiness will be required. All intending entrants are strongly advised during trials, to hold adequate insurance cover for all Third Party Risks, and to take every precaution against damages to property.

1. **GENERAL**
The prize will be awarded to the entrant who first fulfils the conditions.

2. **PRIZE**
The prize is £5,000 sterling.

3. **ELIGIBILITY**
The entrant, designer and pilot must be citizens of the United Kingdom or the British Commonwealth. The aircraft must be designed, built and flown within the British Commonwealth.

4. **CONDITIONS OF ENTRY**

4.1 **Aircraft**

4.1.1 The machine shall be a heavier-than-air machine.

4.1.2 The use of lighter-than-air gases shall be prohibited.

4.1.3 The machine shall be powered and controlled by the crew of the machine, over the entire flight.

4.1.4 No devices for storing energy either for take-off or for use in flight shall be permitted.

4.1.5 No part of the machine shall be jettisoned during any part of the flight including take-off.

4.2 **Crew**

4.2.1 The crew shall be those persons in the machine during take-off and flight, and there shall be no limit set to their number.

4.2.2 No member of the crew shall be permitted to leave the aircraft at any time during take-off or flight.

4.2.3 One handler or ground crew shall be permitted to assist in stabilizing the machine at the wing tip during take-off.

4.3 **Ground Conditions**

4.3.1 All attempts, which shall include the take-off run, shall be made over approximately level ground and on a course to be approved by The Royal Aero Club.

4.3.2 All attempts shall be made in still air, which shall be defined as a wind not exceeding a mean speed of approximately 10 knots, over the period of the flight.

4.4 **Course**

4.4.1 The course shall be a figure of eight, embracing two turning points, which shall be not less than half a mile apart.

4.4.2 The machine shall be flown clear of and outside each turning point.

4.4.3 The starting line, which shall also be the finishing line, shall be between the turning points and shall be approximately at right angles to the line joining the turning points.

4.4.4 The height, both at the start and the finish, shall be not less than 10 ft. above the ground, otherwise there shall be no restriction in height.

4.4.5 The machine shall be in continuous flight over the entire course.

4.5 **Observation**
Every attempt shall be observed by the Royal Aero Club or by any body or persons authorized by the Royal Aero Club to act as observers.

5. **APPLICATION FOR ENTRY**

5.1 Entry forms shall be obtained from the Royal Aero Club, Aviation Centre, 19 Park Lane, W.1.

5.2 The entry fee shall be £1, which shall be refunded upon the attempt taking place.

5.3 Each application form for entry shall contain an application for Official Observation of the competitor's attempt.

5.4 The fee for Official Observations shall be £15 15s. 0d., which shall be forwarded with the application form.

5.5 The entrant shall undertake to abide by the conditions for Official Observation as set out on the application form and shall undertake to defray all expenses incurred in connection with the Official Observation of the attempt.

5.6 Entry forms and applications for Official Observation of an attempt must be received by the Royal Aero Club at least 30 days prior to the proposed date of the attempt. Applications will be considered in order of receipt at the Royal Aero Club Aviation Centre.

6. **GENERAL CONDITIONS**

6.1 **Insurance**
The entrant must undertake to insure, on behalf of himself, his pilot(s), crew, representatives or employees, against third-party risks in connection with the attempt to a minimum amount of £20,000. Evidence that such insurance has been effected must be produced to the Official Observers prior to the attempt.

6.2 **Eligibility**
In any question regarding the acceptance of entries, eligibility of entrant, pilot, crew or aircraft under these regulations, the decision of the committee shall be final.

6.3 **Supplementary Regulations**
The committee reserves the right to add to, amend or omit any of these regulations and to issue supplementary regulations.

6.4 **Interpretation of Regulations**
The interpretation of these regulations or any of the regulations hereafter issued shall rest entirely with the committee. The entrant shall be solely responsible to the Official Observers for due observance of these regulations and shall be the person with whom the Official Observers will deal in respect thereof, or any other question arising out of this competition.

6.5 **Revision of Regulations**
These regulations shall remain in force for a period of two years from the date of publication. After this time, the Royal Aeronautical Society reserves the right to review and amend these regulations if the prize has not been won.

END OF THE LINE.—B.O.A.C.'s Inaugural Flight of the new Comet 4 service between London and Santiago ended in Santiago within 4 minutes of the scheduled time on January 26. L. to R., H.M. Ambassador to Chile, Ivor T. Pink, Miss Sandys, Sir Gerard D'Elanger, chairman of B.O.A.C., Mr. Duncan Sandys, Minister of Aviation, Sir Aubrey Burke, chairman of de Havillands, and Lady Burke.

Aviation News in General

ROYAL SALUTE.—An R.A.F. Royal Salute to mark the birth of a child to H.M. The Queen will be made in the form of a fly-past over London. Thirty-six Hunters from six squadrons (Nos. 56, 65, 111, 1, 54 and 92) led by Wg. Cdr. G. J. Storey, O.C. Flying, Duxford, will fly over in formation at either 13.00 hrs. or 15.30 hrs., weather permitting, immediately after the announcement. The fly-past, to be made at not less than 2,000 ft. at about 400 m.p.h., will not take place on a Sunday.

KANPUR PRODUCT.—A four-seat utility lightplane, known as the Kanpur-I has been built at the Indian Air Force maintenance depot at Kanpur, where the Avro 748 is to be put into production. The Kanpur-I was designed by A. V. M. Harjinder Singh, A.O.C.-in-C., Maintenance Command. It can be used for agricultural duties or to carry a stretcher.

VERTOL ACQUISITION.—Both the Boeing and Vertol boards of directors have now approved the Boeing plan to acquire Vertol Aircraft Corp. as a wholly owned subsidiary. Vertol shareholders will vote on the plan on February 15 and are expected to agree. The company will then become the Vertol Helicopter Division of Boeing Aircraft.

AFGHAN MiGS. — Recent reports from India indicate that the Soviet Union has supplied about 100 MiG jet fighters to Afghanistan. To date, some 36 Afghan Air Force pilots have been trained by the Russians, who have about 70 pilots in Afghanistan. A further 50 or so Afghan pilots have been sent to Russia for training, and an equal number to India.

AIRCRAFT RECOGNITION.—The next meeting of The Aircraft Recognition Society will be held in the library of the Royal Aeronautical Society, Park Lane, on February 17, at 19.00 hrs. THE AEROPLANE AND ASTRONAUTICS cartoonist, Chris Wren, will be describing his recent journey to Australia and island airfields in the South Pacific.

MISSILE LOAD.—A Lockheed GC-130, the new U.S.A.F. universal drone launcher, seen at Holloman A.F.B. with four drones under its wings. Inboard are two Radioplane drones and two XQ-2C Firebees outboard.

AIRBORNE ALERT COSTS.—The U.S.A.F. has estimated that the extra cost of maintaining S.A.C. bombers on a maximum airborne alert status could exceed £350 million a year. There are three alternative alert plans with estimates ranging from £120 million. By the end of this year the U.S.A.F. expects to have 12 wings with a total of 540 B-52s in service.

DITCHING TESTS.—A scale model of the Short Britannic striking the water during ditching tests at Saunders-Roe. It has the engine nacelles mounted on the leading edge of the wing; now discarded for underslung nacelles.

ACCIDENT INVESTIGATION.—Since October, 1959, the C.A.B., helped by the F.A.A., has been assigning a "human factors team" to each fatal accident investigation. These teams seek to determine whether "any physical disability of the human mechanism may have contributed to the accident, and by a study of the human aspects, attempt to reconstruct the events leading to the mishap."

DELIVERY RECORD.—By the end of 1959, Boeing had delivered 81 Boeing 707s to eight airlines, and every delivery had been on or ahead of contract dates (allowing for the renegotiated contract with Qantas when modifications were ordered in the control systems).

HSS-2 PROGRESS.—Prototypes of the Sikorsky HSS-2 twin-turbine anti-submarine helicopters have now flown well over 200 hours on engineering flight trials. On one flight an HSS-2 has hovered continuously over one spot for more than three hours, and several typical Naval 4-hour missions have been completed. The Sikorsky S-61 and Westland WS-61 Wiltshire are based on the HSS-2 design.

U.K. ROCKETRY. — The Royal Society and the Royal Meteorological Society are holding a joint discussion on "The British Rocket Programme" at the Royal Society of Arts on March 14 from 14.30 to 19.30 hrs. With Prof. H. S. W. Massey in the chair, 10 speakers will deal with rocket performance, instrumentation, and upper air physics.

BELGIUM SELECTS F-104. — The Belgian Government announced last week that the Lockheed F-104 Starfighter has been chosen to re-equip Belgian Air Force fighter squadrons. Approximately 170 Starfighters, partly manufactured by the Belgian aircraft industry, are to be purchased. This announcement follows the recent Dutch and German orders for the interceptor.

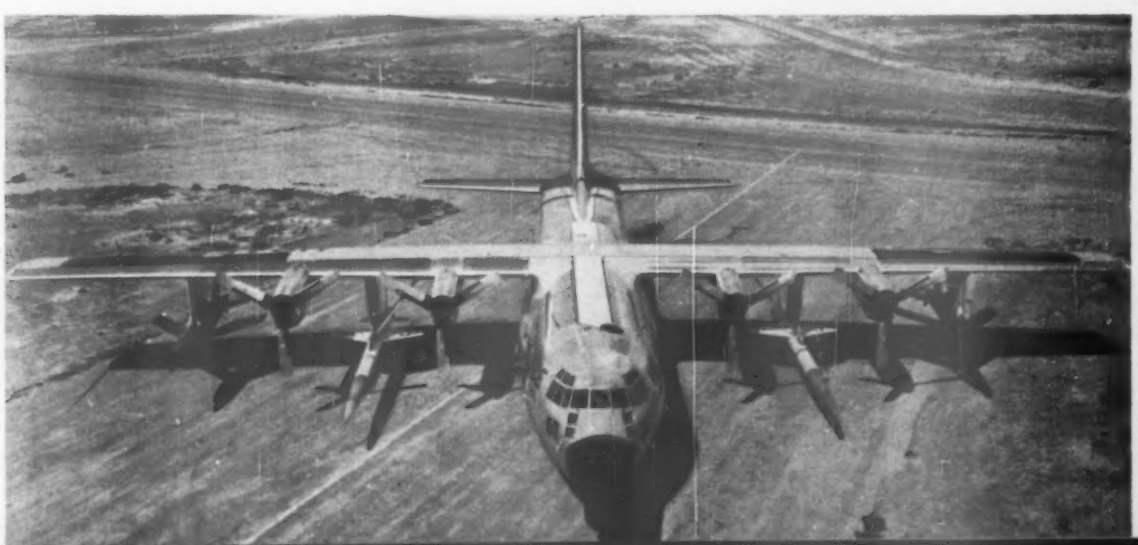
PICTURE VIA MOON.—The U.S. Navy sent messages and a photograph between Washington and Hawaii on January 28 by "bouncing" signals off the Moon.

MRS. MASEVICH.—As well as speaking before the British Interplanetary Society on Feb. 10, as reported last week, Prof. Alla Masevich, vice-president of the Astronomical Council of the U.S.S.R. Academy of Sciences, is lecturing elsewhere in this country. She will lecture on "The Conquest of Space" at the Royal Festival Hall, London, on Feb. 6; Birmingham Town Hall, Feb. 8; Colston Hall, Bristol, Feb. 9; and the Free Trade Hall, Manchester, Feb. 12, at 19.30 hrs. in each case.

A LOVELL LECTURE. — Prof. A. C. B. Lovell will lecture on "The Exploration of Outer Space" at the Royal Society of Arts on Feb. 24, at 14.30 hrs.

SECOND PACIFIC ROCKET?—A second multi-stage ballistic rocket was fired from the U.S.S.R. into the Central Pacific on Jan. 31. First report came from the crew of a U.S. Navy aircraft patrolling near the prescribed impact area who saw "what seemed to be a missile" re-enter the atmosphere at about 17.00 G.M.T.

SUN PROBE.—The Thor-Able VI deep-space probe intended to circle the Sun between the orbits of Earth and Venus was expected to be launched this week. Launching was postponed from last December.



Commercial Aviation Affairs

IATA IN PARIS.—The special meeting of the IATA Traffic Conferences (announced in our previous issue) is to be held in Paris under the chairmanship of V. H. L. Dubourcq, vice-president of K.L.M. The meeting will start on February 23 and will discuss passenger fares on all routes except those between Western Hemisphere countries across the South Atlantic, and within and between Europe and the Middle East; and also the number of classes of service to be offered, cabin configurations in new aircraft and fare differentials between turbojets and turboprops.

INDIAN ORDERS.—Indian Airlines Corporation has ordered five Fokker F-27s, with an option on five more, for delivery in 1961. Air India International has ordered a fourth Boeing 707-420, for delivery in April, 1961.

DC-8 DATA.—Douglas has confirmed that the true level flight speed of the DC-8 with JT4A-3 engines, is 507 knots at max. cruise thrust at 30,000 ft. and 220,000 lb. weight (see our previous issue). This model has been certificated at 276,000 lb. and has a range of 3,300 naut. miles with 34,030-lb. payload (122 passengers and 13,900 lb. freight) with normal allowances and reserves for 260 naut. miles and one-hour holding. F.A.A. field length required for max.-weight take-off is given as 8,500 ft., and for max. weight (193,000 lb.) landing, 6,400 ft.

THE 61st CARAVELLE.—Royal Air Maroc announced on January 29 that it had taken up its option on a second Sud Aviation Caravelle, bringing to 61 the total of firm orders for the type.

ARGONAUT DISPOSAL.—With the sale of four more Argonauts to Overseas Aviation (C.I.), Ltd., to give this independent operator a fleet of nine, B.O.A.C. has disposed of its whole fleet of these Merlin-engined Canadair transports. Two will, however, remain in service on the Abadan route for a month or two longer. Two of the 22 were written off and one has been allocated for B.O.A.C. apprentice training; of the others, East African Airways has three, Aden Airways three and the Royal Rhodesian Air Force, four.

P.A.A., TOO.—Pan American, in common with other airlines, will end the surcharge on jet flights from March 1, in accordance with IATA agreements.

CORPORATION CAPITAL.—The Air Corporations Bill was read for the third time and passed by the Commons on January 27. This Bill increases the borrowing powers of B.O.A.C. from £160 million to £180 million and of B.E.A. from £60 million to £95 million.

MASTER PILOTS.—GAPAN has awarded Master Air Pilot certificates to: Capt. A. C. T. Evans, who flew with Aquila from 1952 to 1956 and subsequently with Britavia; Capt. B. M. Taber, with T.A.A. since 1947; and Capt. D. A. Winch, with T.A.A. since 1946.

MIDLAND LINK.—B.E.A. is to provide a Viscount feeder service between Birmingham and London in both directions to connect with outgoing and incoming night tourist flights at London. Cost of the Birmingham-London flight will be as low as 10s. when included in a through ticket to European cities.

GERMAN BOEINGS.—Lufthansa has now signed its order for four Boeing 720B medium-haul transports, with Pratt and Whitney JT3D-1 turbofan engines, for delivery in 1961. One more Conway-engined 707-420 has also been ordered by Lufthansa, which has four on order already.

News About People

NEW SWEDISH C.-IN-C.—Maj.-Gen. Torsten Rapp is to become C.-in-C. of the Royal Swedish Air Force on July 1, 1960, for a period of six years. At present head of the Air Force Administration, he will be promoted to the rank of Lt.-Gen. and succeed Lt.-Gen. Axel Ljungdahl, who has been C.-in-C. for the past six years.

PIASECKI APPOINTMENT.—Capt. R. S. Camera, U.S.N. (retd.), has joined Piasecki Aircraft Corpn. of Philadelphia, as executive engineer. He is an authority on the application of rotary-wing craft to anti-submarine warfare.

DOUGLAS PLANNING.—A new post of assistant to the president-corporate, planning and development, has been created by Douglas Aircraft. Mr. C. B. Buckley has been appointed to the post and will have responsibility for "evaluating and co-ordinating opportunities for the company to diversify its activities."

AN ACADEMIC APPOINTMENT.—Mr. R. Paul Harrington, A.F.I.A.S., who has been appointed Professor and Head of the Department of Aeronautical Engineering in the College of Engineering at C.A.B.'s Bureau of Safety, has been Professor of Aeronautical Engineering at Rensselaer Polytechnic Institute, prior to which he was Technical Director of the NATO Training Center for Experimental Aerodynamics near Brussels.

SAFETY APPOINTMENT.—Mr. Oscar Bakke, the director of the C.A.B.'s Bureau of Safety, has been appointed director of the F.A.A. Bureau of Flight Standards.

CANADIAN CHANGES.—As part of an administrative reorganization in A. V. Roe Canada's aeronautical group Mr. K. W. Brown has been appointed vice-president and general manager of Avro Aircraft; Air Marshal J. L. Plant becomes vice-president and general manager of Canadian Applied Research Ltd.; and Mr. B. A. Avery becomes vice-president and assistant general manager of Orenda Engines Ltd. Chairman and president of the three companies is Mr. H. R. Smith, executive vice-president, aeronautical, of A. V. Roe Canada Ltd.

EXECUTIVE ORDER.—McAlpine Aviation Manager Raymond Young hands over the C. of A. for the Piaggio P.166 eight-seat executive aircraft supplied to Messrs. John Blackwood, Hodge and Co., by McAlpine Aviation. Mr. Leonard Sunley and the company's staff pilot C. "Topsy" Turner received the aircraft at their Luton base.

IRWIN APPOINTMENT.—Air Vice-Marshal W. A. Opie, C.B., C.B.E., M.I.Mech.E., F.R.Ae.S., R.A.F.(Retd.), has joined the board of Irwin Technical Ltd.; in 1953 he was assistant controller of aircraft at M.o.S. and prior to his retirement was A.O.C. No. 41 Group. Irwin Technical prepares all types of instructional and publicity material on technical subjects.

ENGLISH STEEL CHANGES.—Dr. H. H. Burton, C.B.E., retired from the board of English Steel Corporation, Ltd., on January 31, but will continue as research consultant to the Group until the end of the year. Mr. T. R. Middleton, B.Sc., became a director of English Steel and director of research on February 1.

BOARD APPOINTMENT.—Cellon, Ltd., has announced the appointment of Wg. Cdr. Cantrill to the board of directors. As sales manager of the Cellon Aircraft Finishes Division, Wg. Cdr. Cantrill is a well-known figure in the aircraft industry. He joined Cellon in 1930.

M.A.P.-MAN.—Wartime members of M.A.P. and many in the Aircraft Industry will be sorry to hear of the sudden death of C. H. Duncan Elliott on January 22 last. Mr. Elliott, who was in his early sixties, became a member of the Royal Aero Club in 1939 on his return to this country from India. During the late War he was an Assistant Director of Aircraft Production.

Air Transport

Completing His Term

SIR GERARD D'ERLANGER, part-time chairman of B.O.A.C., is to resign when his term of office comes to an end on April 30, 1961, in order to devote all his time to his private business. Sir George Cribbett, deputy chairman of B.O.A.C. and chairman of B.O.A.C. Associated Companies, is to resign on April 30, this year, for reasons of health.

Making this known last week-end in a statement from Buenos Aires (where he was taking part in the inauguration of the B.O.A.C. Comet service to South America) the Minister of Aviation, Mr. Duncan Sandys, ended recent speculation about possible changes in the Corporation's management. Sir Gerard, he said, had made known his wishes last November; and Sir George had indicated, early in January, his inability to continue for more than another three months.

Mr. Sandys said he had "not as yet taken any decisions about future appointments," and B.O.A.C. was unable to comment upon last week's persistent report that Mr. Eric Rylands, chairman of Skyways, is to be appointed chairman of B.O.A.C. Associated Companies.

Turboprop v. Turbojet Schedules

THAT the turboprop is speed-competitive with the turbojet over short ranges has long been one of the contentions of the turboprop protagonists. Now that both types of turbine transport have been in service in the U.S.A. for over a year —in several cases over the same routes—it is beginning to be possible to judge the value of this claim. Lockheed have recently drawn attention, for instance, to the schedules on the 340-mile Los Angeles-San Francisco sector. Northbound, T.W.A. schedules its Boeing 707 service in 1 hr. 5 min. while the Western Airlines' Electra is scheduled to take 1 hr. 7 min. Southbound on this route, both airlines allow 1 hr. 5 min. in the timetable.

On a route of this length, such a situation is not surprising; it results from the lower cruising altitude of the turboprop and, to use Lockheed's words, its "inherent flexibility and agility . . . [which] permit minimizing ground time and en route manœuvring." What is perhaps more significant is that jet schedules on longer routes in the U.S.A. are being modified, in the light of experience, to achieve better terminal arrival punctuality.

As an example, the New York-Los Angeles schedule time has been increased by 25 minutes to 5 hr. 55 min. and that of the reverse-direction flight by 15 minutes to 4 hr. 45 min. Fifteen minutes has been added to the New York-Chicago time. En route delays, in fact, have been found to be more serious than had been hoped.

Another factor in the turboprop-turbojet battle is the ability of the former to use smaller airports closer to the city centre —such as Chicago's Midway rather than O'Hare, and La Guardia rather than New York International. Regular air travellers in the U.S. are accustomed to measuring journey times between city centres, and the longer road journeys associated with jet travel in some cities have not gone unnoticed.

F.A.A. and ALPA

NEWEST in a recent series of rules made by the Federal Aviation Agency to improve the safety of airline flying is one which will require all turbine-powered transports in service with U.S. airlines to be fitted with weather radar by July 1, 1960. By January 1, 1961, all DC-7, DC-6 and Lockheed 1049 and 1649 series transports must have weather radar, and all other types in service for regular passenger carrying except the DC-3, C-46 and Lockheed 18, must have this equipment by January 1, 1962.

Another new F.A.A. rule forbids passengers on U.S. airlines to drink intoxicating liquor other than that served on board the aircraft, and gives airlines the right to refuse alcoholic drinks to passengers who appear to be intoxicated.

Both these new laws have the support of the Air Line Pilots Association and other bodies, but at the same time the F.A.A. is being vigorously attacked by ALPA for having created an "arbitrary and militaristic empire." The F.A.A. ruling on airline pilots' age limits (our issue for January 1, page 7) was particularly bitterly received by ALPA (17,000 members), which has now joined forces with the Aircraft Owners and Pilots Association (78,000 members) to raise the issue of the F.A.A.'s "dictatorship" in Congress.

A joint ALPA/AOPA statement speaks of the imperative need to "have restored a system of checks and balances which will preserve the rights of citizens engaged in the aviation industry." The F.A.A.'s present way of doing business is described as "unprecedented in the history of U.S. Government," with no "effective appeal" possible.

The Air-freight Business

MOST of a phenomenal increase in total freight loads recorded for October last year by the U.K. aerodromes can be explained by vehicle ferry expansion. The total showed a 56% increase on that for the same month of 1958, but whereas the London area total, for instance, increased by 26%, Ferryfield's total increased by 83% from 4,358 to 7,912 short tons.

"Another essential item was 100 crates of plate glass, of which not one sheet was cracked on the air trip, although trucking later produced normal breakage." This is one sentence in a little news release about a 500-ton airlift designed to ensure the opening on schedule of a new luxury hotel at Ocho Rios in Jamaica. The job was done by Southeastern Airways of Miami in 100 round trips with C-46s and the loads included such things as the operating machinery for two passenger elevators. Montego Bay, 77 miles away, was used as the terminal for most of the flights, but occasional landings with lighter loads were made on the hotel's air strip.

JETWAY OPERATION.—Two Douglas DC-8s of United Air Lines ready to take on passengers at San Francisco International Airport, showing the jetway corridors which United now has in use at this airport and at New York International.

Air Transport . . . .

Co-operation for Competition

Mergers and re-groupings among the British independent operators are in the news. Some of the possibilities are discussed here, with a guide to the companies which may be involved.

DURING the next month or two there are likely to be some considerable re-alignments among the British independent operators. These changes and mergers will be the result of the Minister of Aviation's wish to see two, or perhaps three, really strong units ready for action before considering the next possible steps—the approval of specific areas of operation, the setting-up of a licensing authority and, it may well be, some controlled competition between Corporations and independents on heavier-traffic routes.

It will be sad, for many of us, to see the engulfing of some of the independents who have helped, even in a smaller way, to make British air transport. Nevertheless, it is obvious enough that, in any major policy change, the Ministry would have found it almost impossible to deal with the 30-odd companies which, as the table shows, have approval to operate one or more regular services under associate arrangements with the Corporations. By comparison, it will be a simple matter to deal primarily with two or three groups.

First thoughts might suggest that there will still be plenty of room for individual non-scheduled operators, but whether this will be so depends on the changes which may be made in the Civil Aviation and Air Corporations Acts, and on the powers of the new licensing authority. This authority is likely to have an interest in charter operations and there will be a tidying-up of the law to ensure that so-called closed groups really are closed in the fullest meaning of the term—in other words, that group charters will only be possible for clubs and institutions which have a clear *raison d'être* apart from travel.

All this may make the life of the small unattached independent a difficult one. Clearly, a licensing authority which has these wider powers will also need to be in a position to make very quick decisions, but its work will be simplified by means of an overall "approved area of operation" policy which covers the approval of charters as well as the licensing of scheduled services. Such a policy will also help to ease the international and inter-airline difficulties encountered in arranging clearances for bulk passenger charters such as those involved in the movement of ships' crews.

Assuming that the independents are preparing to clear their decks for action within wider, but more carefully controlled, spheres of influence; that the law is changed; and that a full autonomous licensing authority is formed—how might a territorial "carve-up" be planned so that the results will be to the overall benefit of British air transport, the passenger and the freight shipper?

A basic solution—after encouraging mergers or very close co-operation between groups of operators with broadly similar geographical interests—would be that of offering each major organization a particular territory or series of territories within which licensed scheduled service rights could be granted. In simplest form, for instance, a Silver City group might become a second "chosen instrument" for domestic and European services, while an Airwork-Hunting group might be the approved carrier for services additional to, or parallel to, those operated within B.O.A.C.'s present sphere of influence. Something on these lines—or leading eventually to similar results—will almost certainly come about.

Approved Independent Operator	Domestic Passenger	International Passenger	Vehicle Ferry	Coach Class	All-freight	Helicopter	Inclusive and Circular Tours
African Air Safaris		×	×				×
Air Charter (Airwork Group)		×					
Air Kruise (B.A.S. Group)	×	×	×				
Airlines (Jersey)		×		×	×		×
Airwork		×					
Aquila Airways	×	×	×		×		×
B.K.S. Air Transport		×					×
Britavia (B.A.S. Group)	×	×					
Cambrian Airways							×
Claydon Aviation							×
Continental Air Services	×	×					×
Dan-Air Services	×	×					×
Derby Aviation	×						×
Don Everall (Aviation)							×
Eagle Aviation	×	×			×		
Eagle Airways	×	×					×
East Anglian Flying Services		×		×	×		×
Hunting-Clan Air Transport	×						
Manx Airlines (B.A.S. Group)	×	×					
Morton Air Services (Airwork Group)	×	×					
Olley Air Service (Airwork Group)		×			×		×
Orion Airways		×					×
Overseas Aviation (C.I.)	×						
Scottish Airlines (Prestwick)	×	×	×		×	×	×
Silver City Airways		×		×	×		×
Skyways		×					×
Skyways Coach Air	×	×					×
Starways		×			×		×
Tradair	×						
Transair (Airwork Group)							
Yeadon Aviation							

The pattern of approved services by independent operators.

The detailed development of such a programme must depend on the strength of the groups and on the growth of traffic. Initially, the merged independents' share of scheduled work may be no more than that for which individual operators are already licensed. Later, the share could include parallel services of a different standard and eventually, perhaps, prior rights in certain areas. For instance, the chosen domestic and European private carrier group might take over all internal operations except those on trunk routes where traffic potentials justified parallel operations. It is not, in any case, to be expected that any operator will be prepared to maintain a domestic network in which the plum routes remain a monopoly for another carrier—but there will be need for give and take where these busier trunk services form feeders to, or extensions of, services to and from points in Europe.

Whatever the form of this newest of new deals it must never be forgotten that the independents, as we know them now, developed, in their search for means of business survival, many new sources and types of traffic. Without the spur of competition there might have been no vehicle ferries, no low-fare colonial services and no inclusive tours. It will be for the Government and the new licensing authority to make sure that this spur remains bright and sharp.—H.A.T.

Scheduled Independent Operators

Air Charter, Ltd.—21 Wigmore Street, London, W.1. Directors: F. A. Laker, M. D. N. Wyatt, R. L. Cumming.

Wholly owned Airwork subsidiary. Responsible for vehicle-ferry operations from Southend to Continent with eight Bristol 170s. Charter flying, government-contract freighting and trooping with two Britannias, three DC-4s and a Super Trader (Tudor). Aviation Traders, Ltd., and Aviation Traders (Engineering), Ltd., are associated companies.

Airlines (Jersey), Ltd.—The Airport, St. Peter, Jersey, C.I. Managing director: M. L. Thomas.

Wholly owned subsidiary of Jersey Airlines Development Corporation, in which B.E.A. has had a 25% interest since March, 1956. Operates, as Jersey Airlines, scheduled services within the Channel Islands, to the U.K. and to continental Europe. Aircraft purchased and owned by another subsidiary—the Alares Development Co., Ltd. Fleet comprises six Herons, three DC-3s and a Rapide.

Air Safaris, Ltd.—Old Terminal Building, Gatwick Airport South, Surrey. Directors: W. E. Hamilton, Capt. T. Meredith, Capt. C. M. de Bonnevialle. Operating division of African Air Safaris, Ltd. General charters and inclusive tours with two Vikings and one Hermes 4.

Airwork, Ltd.—Airwork House, 35 Piccadilly, London, W.1. Directors: T. L. E. B. Guinness, M. D. N. Wyatt, F. A. I. Muntz, R. L. Cumming, O. B. S. Poole, G. N. A. Murrant, B. R. Seton-Winton, G. H. Trott, R. C. Benbow, G. H. Freeman, P. B. Guinness, F. A. Laker.

Parent company of Airwork Group. Shareholders are Furness, Withy and Co., Ltd. (about one-third of the total); Blue Star Lines (about one-third); the Whitehall

(*Continued on page 157*)

Only the VANGUARD

paces the jets at much less than half the cost

ALL ROUND Europe, and on record flights in Canada, the Vickers Vanguard has been logging block times which have proved that on short and middle distance routes it can more than hold its own with the jets. It has, in zero wind, beaten current jet schedules on sectors as long as London-Rome (955 st. miles). It has flown London-Gander (2,365 st. miles) in 5 hours 30 minutes, and Toronto-Montreal (335 st. miles) in a record 58 minutes in zero wind.

Other Vanguard block times are:

LONDON-BRUSSELS
230 miles in 45 minutes (5 m.p.h. headwind).

LONDON-HAMBURG
470 miles in 73 minutes—a record (17 m.p.h. tailwind).

LONDON-PARIS
224 miles in 41 minutes (zero wind).

PRESTWICK-KEFLAVIK
920 miles in 2 hours 35 minutes (zero wind).

KEFLAVIK-MONTREAL
2,360 miles in 6 hours 2 minutes (30 m.p.h. headwind).

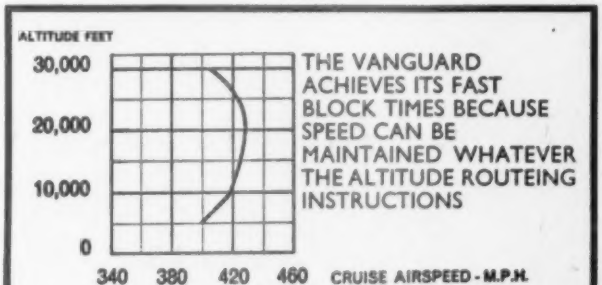
The Vanguard has achieved these block speeds at costs nearly one-third of those of comparable pure jet aircraft.

Recent U.S.A. figures show jet aircraft flight hour direct costs as 2.8 times greater than those of the Vanguard, and seat mile direct costs 2.6 times as great.

The Vickers Vanguard has, without doubt, the biggest profit potential ever offered to the airline industry — and it offers it at proved realistic competitive speeds.

The Economy Class cheap-fare capabilities of the Vanguard are at the forefront of the now established world movement for popular air travel. Only the Vickers Vanguard can bring these vast new markets to the Airlines on short and medium haul routes, at a substantial profit, and the Vanguard can do this with schedules as fast, if not faster, than any other aircraft.

Vanguard costs used in this comparison are to A.T.A. formula. Both the Viscount 745 and the Viscount 810 filed costs have been proved in practice to be substantially below such A.T.A. formula costs.



Of all the airliners only the Vanguard has all these features

425 m.p.h. cruising • Freight capacity 7/8 tons at normal densities • Full routeing and A.T.C. flexibility • Can use normal existing airfields • Quick turn-round • No airfield noise problems • Ten years' unique Vickers/Rolls-Royce turbo-prop experience . . . ***And it is 'Viscount' quiet.***

VICKERS VANGUARD
FOUR ROLLS-ROYCE TYNE TURBO-PROP ENGINES

• ***The airliner with the biggest profit potential ever offered to the operator***

VICKERS-ARMSTRONGS (AIRCRAFT) LIMITED WEYBRIDGE SURREY

AT 427

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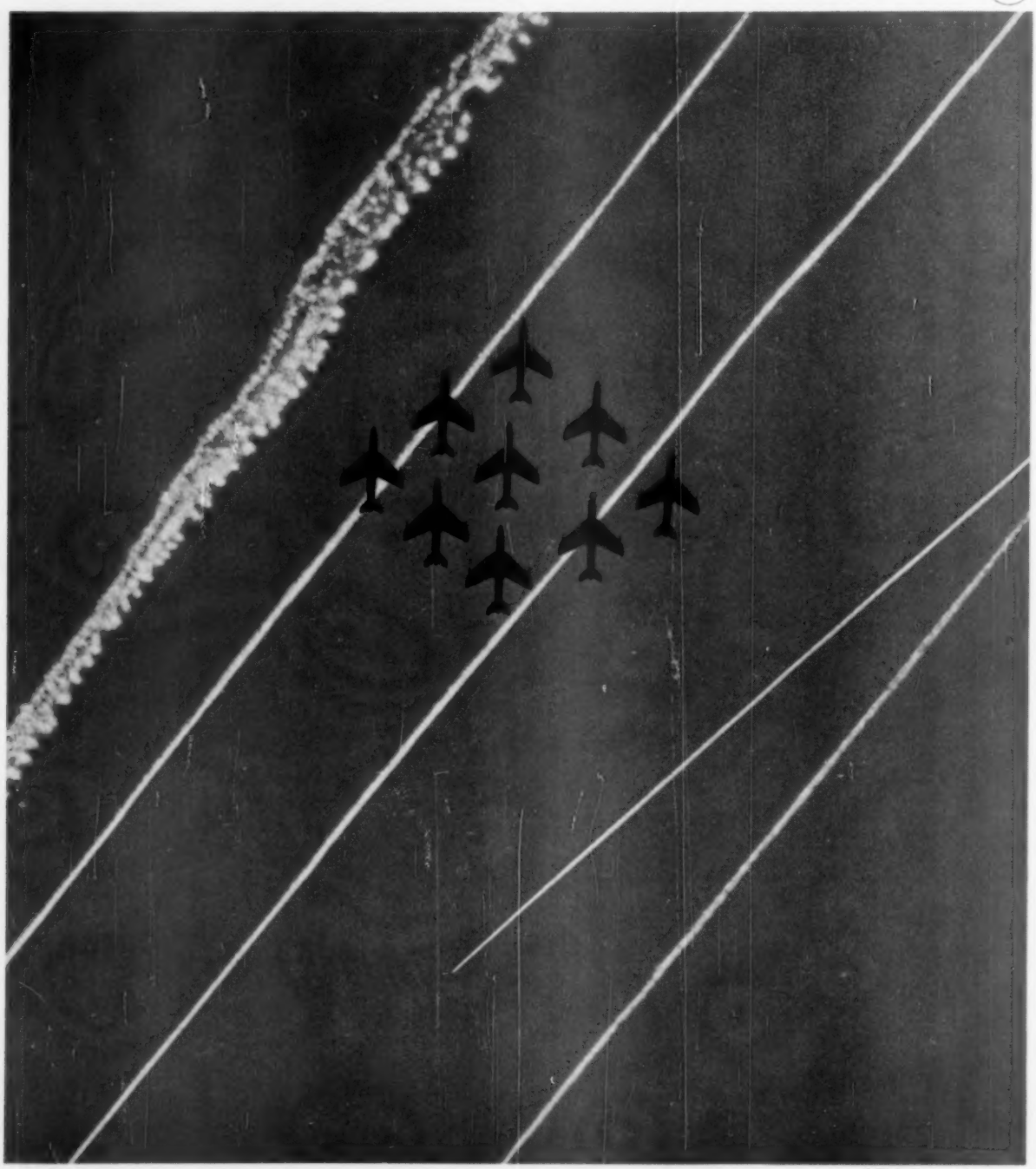
They need oxygen to fly . . .

. . . and British Oxygen supplies it, together with research, development and the oxygen systems that help to make high altitude flight possible. British Oxygen Aviation Services will be glad to help with your problems.

BRITISH OXYGEN AVIATION SERVICES, BRIDGEWATER HOUSE, CLEVELAND ROW, ST. JAMES'S, LONDON, S.W.1 BOC



A Flight Photograph

Scheduled Independent Operators . . . .

(*Continued from page 156*)

Securities Group; and T. L. E. B. Guinness, president of the company (about one-sixth each).

Most of Airwork's operations are conducted by subsidiary and associated companies, but two Viscount 831s still fly in Airwork colours for the Safari services (in conjunction with Hunting-Clan). Other companies in the group (see separate entries) include Air Charter (majority interest), Transair (wholly owned), Morton Air Services and Olley Air Service (wholly owned), Fison-Airwork (half-interest) and Bristow Helicopters (wholly owned).

B.K.S. Air Transport, Ltd.—Berk House, Baker Street, London, W.1. Directors: C. J. Stevens, J. N. Barnby.

Independent privately owned company, operating domestic and international normal scheduled services, vehicle-ferry services and passenger and freight charters with two DC-3s, three Ambassadors and one Bristol 170. Two Avro 748s are on order.

British Aviation Services, Ltd.—Silver City House, 62 Brompton Road, London, S.W.3. Directors: Eoin C. Mekie, Sir Donald F. Anderson, Air Cdre. Sir Arthur V. Harvey, Air Vice-Marshal S. D. Macdonald, Gen. Sir Edwin L. Morris, Sir Edward Wilshaw, A. E. Barnes.

Parent company of B.A.S. group, in which the shareholders are Peninsular and Oriental Steam Navigation Group (70%), Eagle Star Insurance Co., Ltd. (20%) and Cable and Wireless (Holding), Ltd., an investment trust company (10%). B.A.S. now operates all its aircraft under the name of Silver City (which see). Other wholly owned subsidiaries are Britavia, Ltd., Aquila Airways, Ltd., Air Kruise, Ltd., Manx Airlines, Ltd., Manx Aero-Engineering, Ltd., Inclusive Tours, Ltd., Dragon Airways, Ltd., Roadair-Railair, Ltd., Silver Arrow, Ltd., and British Aviation Services (Engineering), Ltd.

Cambrian Airways, Ltd.—Cardiff (Rhoose) Airport, near Barry, Glamorgan. Directors: J. Morgan, C. F. Hughesdon, P. C. F. Lawton, Sir Arnold Overton, L. B. Elwin, W. W. Stanley, J. H. Watts.

Private company in which B.E.A. has held 33⅓% interest since February, 1958. Operates network of scheduled services based on Wales and the West of England with three DC-3 Pionairs leased from B.E.A., and a Heron.

Claydon Aviation, Ltd.—236 Old Bedford Road, Luton, Beds. Directors: C. G. Claydon, I. H. Claydon.

Operates inclusive tours and charters as Pegasus Airlines, with three Vikings.

Continental Air Services, Ltd.—29 Hill Street, St. Helier, Jersey, C.I. Directors: Ian J. Maclean, V. H. Jeffries.

Operates eight Vikings and a DC-4 for general charter and has several inclusive tour routes. Continental Engineering Services, Ltd., is an associated company.

Dan-Air Services, Ltd.—Bilbao House, 36-38 New Broad Street, London, E.C.2. Directors: F. E. F. Newman, J. W. Davies, E. O. Wallis.

Independent privately owned company, specializing in freight charters. Flies daily domestic freight service between Glasgow and London for B.E.A., and has approval for domestic and international scheduled services based on Bristol, in addition to several inclusive tours. Fleet comprises four Yorks, two DC-3s, three Ambassadors and three Bristol 170s.

Derby Aviation, Ltd.—78 Buckingham Gate, London, S.W.1. Directors: Gp. Capt. C. A. B. Wilcock, Wg. Cdr. H. A. Roxburgh, R. R. Paine, D. W. T. Sullivan, Mrs. J. Harben Grice.

As Derby Airways, this privately owned company flies domestic and international scheduled services and inclusive tours in addition to general charters. Fleet includes five DC-3s, three Marathons, two Ansons, a Consul and a Rapide.

Don Everall (Aviation), Ltd.—Elmdon Airport, Birmingham. Directors: Don Everall, Cliff Everall.

Privately owned independent company, approved to operate domestic scheduled services and inclusive tours, with fleet of two DC-3s and two Rapides.

Eagle Airways, Ltd., and Eagle Aviation, Ltd.—Marble Arch House, 40 Edgware Road, London, W.2. Directors: H. R. Bamberg, M. A. Guinane, Maj.-Gen. C. G. B. Greaves, N. Ashton Hill, T. M. Masters, G. D. Peacock, G. W. Pitt, J. H. Sauvage.

Eagle group of companies are wholly independent. Eagle Airways operates international scheduled services and Eagle Aviation undertakes charters, inclusive tours and government trooping contracts, with a joint fleet of 12 Vikings and three DC-6Cs. Associated companies are Eagle Airways (Bermuda), Ltd., and Eagle Airways (Bahamas), Ltd., both operating Viscount services in their local areas. Eagle Aircraft Services, Ltd., the maintenance organization at Blackbushe, London Airport and Manchester; and Eagle Overseas Airways, Ltd., a development and study company.

East Anglian Flying Services, Ltd.—Southend Airport, Southend-on-Sea, Essex. Directors: R. J. Jones, H. A. M. Pascoe, A. E. Hugo Parsons, P. H. Pike.

Independent company operating domestic and international scheduled passenger services and inclusive tours as Channel Airways. Fleet includes four D.H. Doves, two Bristol 170s, four Vikings and two Rapides.

Hunting-Clan Air Transport, Ltd.—London Airport, Hounslow, Middx. Directors: P. Ll. Hunting, G. L. Hunting, C. P. M. Hunting, L. C. Hunting, The Hon. A. Cayzer, R. R. S. Cook, J. L. Smith, J. A. Thompson, Capt. L. B. Greensted, M. H. Curtis (managing).

Wholly owned subsidiary of Hunting-Clan Air Holdings, Ltd., which is jointly owned by Hunting Aviation Management, Ltd. (representing Hunting and Son, Ltd.) and The Clan Line Steamers, Ltd. (representing British and Commonwealth Shipping Co., Ltd.). Operates international scheduled services, including the Viscount Safari to East, West and Central Africa (with Airwork) and the Africargo all-freight service; Government trooping to Far East, East Africa, Aden and Cyprus; inclusive tours and general charters. Fleet comprises two Britannia 317s, three Viscount 833s, two DC-6As, five DC-3s and five Vikings.

Morton Air Services, Ltd., and Olley Air Service, Ltd.—Gatwick Airport, Surrey. Chairman and managing director, T. W. Morton.

Wholly owned subsidiaries of Airwork Group, operating domestic and international scheduled services and seasonal services and inclusive tours, with a fleet of two Herons, five Doves and three Rapides. Morton Engineering Services, Ltd., is associated maintenance subsidiary.

North-South Airlines, Ltd.—Leeds/Bradford Airport, Yeadon, Yorks. Directors: G. G. Rennard, B. H. Rennard.

Private company operating domestic scheduled services with one Heron, on behalf of B.K.S. Air Transport.

Orion Airways, Ltd.—Blackbushe Airport, Camberley, Surrey. Directors, Capt. A. V. Donati, Capt. P. A. Wilson, P. Cross, A. C. H. Paston-Cooper.

Independent scheduled, charter and tour operator with three Vikings. Orion Aircraft Services, Ltd., is subsidiary maintenance company at Coventry.

Overseas Aviation (C.I.), Ltd.—6 York Street, St. Helier, Jersey, C.I. Directors: R. Myhill, B. A. Dromgoole, Capt. D. B. Ludbey, Capt. P. de Vere Stevens.

Privately owned charter and inclusive-tour operators, with fleet of nine Argonauts, five Vikings and a Heron.

Pegasus Airlines.—See Claydon Aviation, Ltd.

Scottish Airlines (Prestwick), Ltd.—Prestwick Airport, Ayrshire, Scotland. Chairman, The Duke of Hamilton; general manager, I. C. Grant.

Operating subsidiary of Scottish Aviation, Ltd., flying scheduled services to the Isle of Man. Fleet comprises one DC-3 and two Twin Pioneers, available for short and long-term charter.

Silver City Airways, Ltd.—Silver City House, 63 Brompton Road, London, S.W.3. Joint managing directors, Eoin C. Mekie (chairman) and H. C. Kennard.

Principal operating subsidiary of British Aviation Services. Operates cross-Channel vehicle-ferry services, scheduled domestic and international passenger services, London-Paris rail-air service, inclusive-tour network and general freight and passenger charters. Combined Silver City fleet comprises 20 Bristol 170s, nine DC-3s, four Hermes, a Heron and a Dove.

Skyways, Ltd.—7 Berkeley Street, London, W.1. Directors: Sir Wavell Wakefield, Eric Rylands, Charles F. Dickson, Derek J. Bibby, Leslie O'B. Harding.

Bibby Shipping Line is major shareholder. Scheduled operations include colonial coach services, an animal transport service U.K.-France and, on behalf of B.O.A.C., an all-freight service to the Far East. Associated Skyways Coach Air operates coach-air services between London and points in France. Inclusive tours also flown. Joint fleet comprises four L-749A Constellations, six Hermes, 10 Yorks and six DC-3s. Three Avro 748s are on order.

Through Eric Rylands, Skyways is associated with Bahamas Airways, which has recently acquired two Hermes from Skyways.

Starways, Ltd.—Liverpool Airport, Liverpool. Directors: F. H. Wilson, J. A. Wilson, A. M. Wilson, G. K. Leigh.

Privately owned company operating three DC-3s and two DC-4s on domestic and international scheduled service, inclusive tours and general charters.

Tradair, Ltd.—Prince Rupert House, 64 Queen Street, London, E.C.4. Directors: E. S. Hanks, L. N. Monnickendam, Capt. J. L. T. Allen.

Privately owned company operating two Viscounts and seven Vikings on inclusive tours and general charters, with two scheduled services approved so far.

Transair, Ltd.—Gatwick Airport, Horley, Surrey. Directors: Gerald H. Freeman, D. J. Grimes, C. Nunn, Air Chief Marshal Sir Hugh Pughe Lloyd, M. D. N. Wyatt, R. L. Cumming, P. Williams.

Wholly owned subsidiary of Airwork Group, operating three Viscounts and six DC-3s on scheduled services, regular mail and newspaper services, inclusive tours and general charters.

Other Independent Companies

In addition to the companies listed above, several others provide facilities for general charters, both passenger and freight, with fixed and rotary-wing equipment. These companies include the following: Air Navigation and Trading Co., Ltd.; Air Taxi (Cumberland), Ltd.; Autair, Ltd.; Blue Air, Ltd.; Bristow Helicopters, Ltd. (Airwork subsidiary); Executair, Ltd.; Falcon Airways, Ltd.; Fison-Airwork, Ltd. (Airwork Group); Helicopter Services, Ltd.; Luton Airways, Ltd.; Maitland Air Charter, Ltd.

The Fighting Services

No. 8 Course E.T.P.S.

TOMORROW night former members of No. 8 Course (1949) at the Empire Test Pilots' School, Farnborough, are holding a reunion dinner at "The Old Manor Hotel," Bracknell. And it is interesting to study the careers of the 29 pilots during the ten years following the course.

Ten are now out of the Service and with commercial companies. These are E. A. Tennant, who is now chief test pilot of Folland Aircraft; A. W. Bedford, now chief test pilot of Hawker Aircraft; J. Harrison, Avro chief test pilot; P. Field, chief test pilot of Ferranti; B. G. Aston and E. D. Glaser, test pilots with Vickers-Armstrongs; B. Radley, deputy chief test pilot with Hunting Aircraft; and Flt. Lt. R. L. Suri, Indian Air Force, now a Wing Commander and chief test pilot, Hindustan Aircraft. M. W. Grierson-Jackson is now a civilian helicopter pilot overseas and D. White is in the sales department of Hunting Aircraft.

Lieut. C. E. Price, R.N., is now a Commander and C.O. of "C" Squadron at Boscombe Down; Flt. Lt. S. Das, I.A.F., is a Wing Commander in India; Flt. Lt. A. D. Woodcock is Wg. Cdr. Flying, R.A.F. Wattisham; and Flt. Lt. D. W. Butler is a Squadron Leader and at the Ministry of Aviation. Altogether, 10 of the course of 29 R.A.F., R.N., Commonwealth Air Forces and American personnel have been killed in flying accidents.

Air Rank Appointments

AIR COMMODORE B. A. CHACKSFIELD, O.B.E., has become Senior Air Staff Officer, Technical Training Command, with the acting rank of Air Vice-Marshal. Completing the 1959 Imperial Defence College course, he was previously Director of Guided Weapons at the Ministry of Supply.

Gp. Capt. R. Sorel-Cameron, C.B.E., A.F.C., Group Captain in charge of training at Headquarters, Flying Training Command, since 1957, has been appointed Air Attaché in Athens, with the acting rank of Air Cdre. He was Commanding Officer of R.A.F. Cottesmore and R.A.F. Feltwell between 1952 and 1956, and was on the directing staff of the Royal Naval College, Greenwich, before going to Flying Training Command.

R.A.F. Fatality Rate

A STATEMENT that the overall R.A.F. fatality rate for 1959 was only a quarter of that for 1950, was reported last week to have been made by the Directorate of Flight Safety. Last year, it was said, there were 31 fatal accidents in which 56 personnel were killed, compared with 120 fatal accidents in 1950 causing 242 deaths.

This is the first occasion on which such figures have been attributed to the Directorate and, although the Air Ministry will not expand on the statement—which appeared in *The Times*—it would seem to represent a step in the right direction. Compared with the usual statements such as "fatal accident rates for both jet and piston-engined aircraft in 1958 are the lowest ever recorded," which means very little without some reference to the number of hours flown; the figure of a 75% reduction in the fatality rate provides a more concise indication of the improving standard of flying safety in the Service.

In America, without releasing classified information, such as the total number of hours flown by the Service in a particular period of time, the U.S.A.F. Director of Flight Safety Research provides an annual breakdown of American military flying accidents. This is usually in the form of a rate for a number of hours flown for a particular accident category. For example, in 1958 the U.S.A.F. major accident rate was approximately 10.8 per 100,000 hr. flown; in 1950 it was 36 per 100,000 hr.

Last year there were 376 fatalities in U.S.A.F. flying accidents, compared with 705 in 1958. The loss of 469 aircraft in air and ground accidents in 1959 was 12% less than the previous year.

R.A.F. Appointments

THE following are among recent Royal Air Force appointments:—

Air Ministry: Wg. Cdr. G. H. Dhenin, A.F.C., G.M., and Wg. Cdr. A. C. Camm, to the Department of the Air Member for Personnel for medical staff duties.

Bomber Command: Wg. Cdr. F. Bellam to R.A.F. Waddington as Senior Technical Officer.

Fighter Command: Wg. Cdr. G. C. Brunner, A.F.C., to Headquarters Air Traffic Services for operational control duties.

Transport Command: Gp. Capt. C. V. Winn, D.S.O., O.B.E., D.F.C., to No. 38 Group as Senior Air Staff Officer; Wg. Cdr. A. J. Payn, O.B.E., to R.A.F. Northolt to command the flying wing.

Technical Training Command: Gp. Capt. A. S. Amsden to R.A.F. Cardington as Senior Medical Officer.

Signals Command: Gp. Capt. W. B. S. Simpson, M.A., to Headquarters as Senior Technical Staff Officer.

British Forces Arabian Peninsula: Sqn. Ldr. F. M. Hegarty, A.F.C., to Headquarters for air staff duties with the acting rank of Wg. Cdr.

R.A.F. Germany: Gp. Capt. S. G. Wise, C.B.E., D.F.C., to No. 2 Tactical Operations Centre as Chief of Staff; Wg. Cdr. A. P. Dottridge, D.F.C., to R.A.F. Goch as Air Defence Commander No. 348 Squadron, with the acting rank of Gp. Capt.; Wg. Cdr. C. W. Hayes, O.B.E., to R.A.F. Sylt, to command the administrative wing.

Other Appointments: Sqn. Ldr. H. B. Alty, M.B.E., to the Ministry of Aviation, with the acting rank of Wg. Cdr.

More Service News

No. 12 Squadron.—A history of No. 12 Squadron is being written and the compiler would like to hear from former members who may be able to provide material in the form of stories or photographs. Those who can help are requested to contact Flg. Off. T. Mason, No. 12 Squadron, R.A.F. Coningsby, Lincs.

Arabian Peninsula.—A new car flag is now in use by the C.-in-C., British Forces Arabian Peninsula, Air Chief Marshal Sir Hubert Patch. Representing the three Services of this first unified overseas Command, its badge incorporates a fouled anchor, crossed swords and an eagle, surmounted by the crown.

R.O.C. Recruiting.—A marked upward trend in recruiting for the Royal Observer Corps is shown in the final figures for 1959. Altogether 2,754 men and women joined the Corps last year, bringing its current strength to 15,805.

Rugby Union.—The President of the R.A.F. Rugby Union, Air Marshal Sir Kenneth Cross, and the executive committee entertained the Past President, Marshal of the R.A.F. Sir Dermot Boyle, to a farewell dinner party in the R.A.F. Club last month. Present were Air Vice-Marshal G. A. Walker; Air Cdres. A. D. Warrington-Morris, and D. M. Strong; Gp. Capt. A. V. Rogers; Wg. Cdrs. N. Cameron, R. H. G. Weighill and G. E. Jones; Sqn. Ldrs. R. V. Stirling and D. R. Morgan; Flt. Lts. G. J. A. Head and V. A. Harfield; and Flg. Off. L. H. Jenkins.

R.A.F. Sailing.—The Commodores and committee members of the R.A.F. Sailing Association and the R.A.F. Yacht Club, Hamble, dined together for the first time on January 22 at a "Yachtsman's Guest Night" held at R.A.F. Thorney Island. It was described as an event forming a bridge over the broad gap between R.A.F. sailing categories—dinghies and deep-sea craft.

FAR EAST RECONNAISSANCE.—Flown by Flg. Off. G. W. Paul, a Meteor P.R. 10 of No. 81 Squadron recently completed the unit's 10,000th. photographic reconnaissance sortie in the Far East. Now based at R.A.F. Tengah, the Squadron has been with the Far East Air Force since September, 1946.

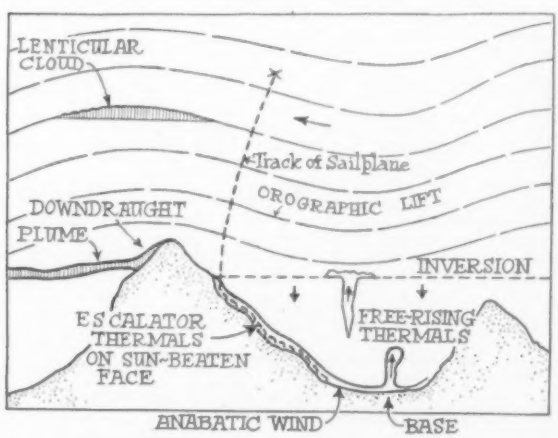
Soaring in the Himalayas

PERMISSION has been received for a gliding expedition consisting of up to four sailplanes and two powered tow aircraft, together with an average of two pilots per aircraft, to visit Nepal in the spring, dates April 16 to May 31 approximately, with bases at Katmandu and Pokhara, with a view to carrying out a flying programme to investigate mountain air currents and possibly to ascend Annapurna in order to provide operational and meteorological data for an attempt on Everest in years to come. It is hoped in this short period of time to organize an expedition of the permitted size.

The weather information is based on direct evidence from pilots in other mountain ranges such as exist in Switzerland, California and New Zealand, together with circumstantial evidence based on weather theory and the accounts of mountaineers in the Himalayas. It appears that the atmosphere in these mountains can be divided into two zones, one above the other.

In the lower zone, extending to about 15,000 or 20,000 ft., up-currents are provided by convection. As distinct from thermals in flat country which will rise vertically from the ground, in mountainous country, though thermals may ascend vertically from the valley floor, more often an "escalator-" type thermal is found on the Sun-heated faces of mountains. These may be augmented by a prevailing wind blowing onto the slope.

When it is realized that bright sunshine at these altitudes is the equivalent of about 500,000 h.p. per square mile and that rock faces of several square miles in extent are not unusual in these regions, it becomes apparent how spectacular the gliding possibilities are. Black bulb temperatures of 69° C. have been measured on Everest at 25,000 ft. where pools of melted snow were also observed. Lammergeyers and griffon vultures have been observed soaring at 20,000-23,000 ft. in that region.



Above this zone of convection, there exists at the time of the year in question, a strong prevailing west to north-westerly wind associated with a jet stream in these latitudes which should provide strong orographic lift together with associated wave-lift from the west faces of the mountains.

It seems feasible to make ascents from a low altitude above the airfield at Pokhara which is itself 3,000 ft. a.s.l. to altitudes of the order of 45,000 ft. where further climbs are limited by the necessity for pressurized aircraft. Since the gliding angle of the sailplanes used will be of the order of 1 in 30 at about 45 knots indicated, the possibility of long cross-country flights in years to come, when further experience has been obtained, is obviously very attractive.

The hazards of gliding over such terrain are numerous. However, it is hoped that a suitable flying programme, together with detailed planning and good equipment, should enable pilots to avoid any major difficulties.

It is hoped that the full six weeks can be devoted to flying. During the first week, pilots will be familiarized with the territory by reconnaissance flights in powered aircraft, and over subsequent weeks the soaring programme, though at first conservative, will progressively become more ambitious.

The regions around base will be divided into circular zones and the pilot's position with regard to these zones will be dictated by a formula, at first of 3 miles per 1,000 ft. plus 1,000 ft. in hand (for example with 11,000 ft. of altitude above base, he may not go beyond 30 miles from base).

It is hoped to maintain continuous radio contact between each pilot and base and between individual pilots. Pilots will attempt to fly in a gaggle of four so that they are connected by radio much as mountaineers are connected by rope.

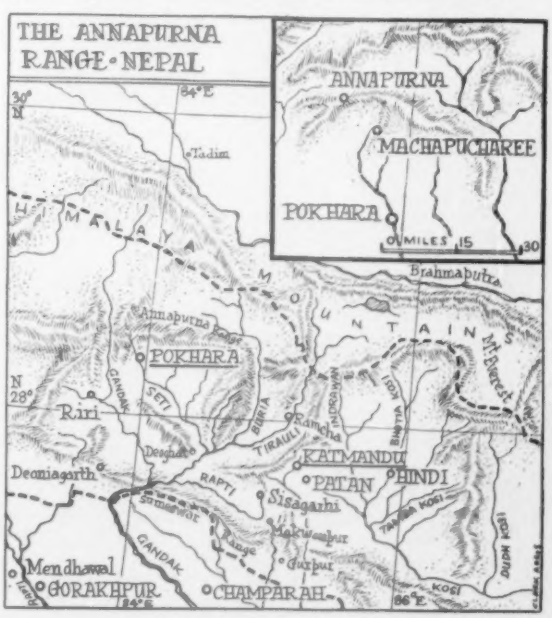
All possible efforts will be taken in the planning and organization of the soaring programme to prevent the eventuality of a forced landing away from base. However, pilots will be provided with survival equipment, such as parachutes, emergency oxygen, SARAH, food, warm clothing and camping gear.

Personnel are being chosen as far as possible on the basis of flying ability, experience, and ability to contribute usefully to the ground organization. It will include a professional meteorologist, two scientists, dentist and doctor and will be provided with a liaison officer by the Nepalese government.

During the same period a mountaineering party under the leadership of Col. J. O. M. Roberts is climbing Annapurna II. This should give an excellent opportunity to explore the possibilities of collaboration between the mountaineering and soaring parties, since the soaring party can give weather information to the mountaineers. If an emergency arose to a sailplane, the pilot could elect to force-land near one of the mountaineers' camps which would give him a considerably increased chance of survival. On the other hand, the pilots of the sailplanes might possibly assist the mountaineers by dropping supplies.

Detailed records will be kept, with particular emphasis on photographic and cinematographic evidence. It is hoped thus to provide a record of a mountaineering attempt from the air which should be of interest to mountaineers and sailplane pilots alike.

In conclusion, it may be stated that this is an ambitious attempt to use soaring techniques to attain a mountaineering objective. It is hoped that sufficient support will be forthcoming so that these plans may be realized, in the short period of time which remains, to the Mountain Soaring Group who are the organizers of this expedition.—BRENNIG JAMES.



West Germany's Aircraft

Once again German aircraft factories are in production. What is this vigorous industry building? What are the plans of its talented engineers for the future? J. R. COWNIE, *of* THE AEROPLANE AND ASTRONAUTICS, *went to find out.*

WESTERN GERMANY is now building 112 Noratlas transports, 190 Piaggio piston-engined trainers, 244 Magister jet trainers and 428 Dornier Do.27 liaison aircraft. Most of these will be delivered by the end of 1960, and work is beginning on at least 150 Fiat G.91 strike aircraft and an initial order for 210 Lockheed F-104G Starfighters, of which 564 may be built in all. In addition, Lycoming piston engines are in production and the Bristol Siddeley Orpheus and General Electric J79 turbojets are to be built. German anti-tank missiles are in production, others are under development and production of U.S. missiles is likely.

A turboprop military transport, the Transall C.160, is being designed and built in collaboration with France and a VTOL strike fighter is being designed by a German group.

These are no small achievements for an industry which came back to life less than five years ago, in May, 1955. It is nowise dismayed by the man-size production task ahead of it. Last April it was stated that the industry employed about 20,000 people, 12,000 on airframes, 1,000 on engines and 7,000 on associated production. These figures must be well out of date today, and most sections of the industry are expanding; only the northern companies seem large enough for the task in hand.

Germany's aircraft industry repays study as an example of recovery and continued growth against a World tendency towards a decline in aircraft production. It is an industry with which Britain will work more closely in years to come.

This report is based on a nine-day tour arranged at our request by the Bundesverband der Deutschen Luftfahrtindustrie; it covered visits to the Messerschmitt, Bölkow, MAN, BMW, Dornier, Heinkel, Rhein, Weser, Focke-Wulf and Hamburger companies. To give as complete a picture as possible, it also includes information about the other companies in the industry.

A measure of British interest in the German industry is given by the companies represented at the Hanover Air Show last year; these included Alvis, Auster, Bristol Siddeley, British Messier, British Oxygen Aro Equipment, Hunting, Marconi, Normalair, Rotol, Sperry and Solartron. Other companies also have close links with Germany, as this report shows.

Germany was given permission in May, 1955, to resume the building of aircraft. Manufacturers were faced by considerable difficulties—many factories had been destroyed by bombing, dismantled after the War or stripped of equipment for reparations. Technical staff and skilled workers had dispersed to other industries. The ten lost years had been years of intense activity and rapid technical advance abroad. In addition, public opinion in Germany tended to be unenthusiastic about rebuilding an industry which, it was felt, could not easily catch up lost time and which, in any case, would be devoted mainly to producing military aircraft. It was argued that Germany should import the aircraft needed for her defence.

Nevertheless, there was influential support for rebuilding the industry. The Federal Defence Minister, Dr. Strauss, favoured a new start on aircraft research and production in Germany. He considered that an aircraft industry was essential because of the stimulus and benefits it brought to a country's industry as a whole—a view taken by the British Government about our industry.

With few exceptions the German aircraft companies came back into business after the War, but not initially as aircraft producers. Perhaps the best-known examples of their post-war products were the Messerschmitt and Heinkel bubble cars produced before aircraft construction was allowed.

Here lies a major difference between British and German aircraft companies. While British companies today search widely for ways of diversifying their activities, most German companies started after the War with total diversification—in fact, they produced no aircraft. Today some of these companies plan to increase their aircraft output by cutting down on their industrial work—a state of affairs which British manufacturers can only envy.

In 1955 it was impossible for Germany to develop new aircraft and it was decided to produce foreign military aircraft under licence for the German Services. This was done to give the industry production experience on modern types. The only German design chosen for production was the Dornier Do.27, a special case because this aircraft had been developed in Spain, thereby avoiding the ban on German aircraft development. This procedure had also been followed by German aircraft companies after World War 1.

The foreign aircraft chosen were two French types, the Fouga Magister jet trainer and the Nord Noratlas transport, and the Italian Piaggio P.149 piston-engined trainer. The 270-b.h.p. Lycoming engine which powers both the Piaggio

(*Continued on page 164*)

GERMAN AIRCRAFT COMPANIES AND RESEARCH ESTABLISHMENTS

1---16 MILITARY PRODUCTION COMPANIES

1. BMW Triebwerkbau G.m.b.H., Munich.
2. Bodenseewerk Perkin Elmer and Co., G.m.b.H., Uberlingen.
3A. Bölkow-Entwicklungen KG, Ottobrunn, near Munich (head office and development centre).
3B. Bölkow factory at Augsburg.
3C. Bölkow factory at Nabern, near Stuttgart.
4A. Dornier-Werke G.m.b.H., Friedrichshaven (design office).
4B. Dornier factory, Neuaubing, near Munich.
4C. Dornier assembly and overhaul shops and airfield, Oberpfaffenhoven.
5. Focke-Wulf G.m.b.H., Bremen airport.
6A. Hamburger Flugzeugbau G.m.b.H., Finkenwerder, near Hamburg (design office, assembly and overhaul shops, airfield).
6B. Hamburger factory at Stade.
7A. Ernst Heinkel G.m.b.H., Speyer (aircraft factory).
7B. Ernst Heinkel AG, Stuttgart (aero-engine overhaul).
8. Klöckner-Humboldt-Deutz AG, Cologne.
9. MAN Turbomotoren G.m.b.H., Munich.
10A. Messerschmitt AG, Augsburg (aircraft factory).
10B. Messerschmitt assembly and overhaul shops, Munich-Riem airport.
11. Siebelwerke ATG G.m.b.H., Donauworth.
12A. Weser Flugzeugbau G.m.b.H., Bremen (design office).
12B. Weser jig-and-tool factory at Varel.
12C. Weser factory at Einswarden.
12D. Weser overhaul shops and airfield at Lemwerder.

17---28 OTHER COMPANIES

13. Aero Flugzeugbau Hubert Zuerl, Munich.
14. Prof. Dipl.-Ing. W. Blume Leichtbau und Flugtechnik G.m.b.H., Duisburg.
15. Carl F. W. Borgward, G.m.b.H., Bremen.
16. Burgfalke Flugzeugbau, Burglenfeld, near Regensburg.
17. Daimler-Benz AG, Stuttgart.
18. Möwe-Flugzeugbau Heini Dittmar, Augsburg.
19. Henschel Flugzeugwerke AG, Kassel.
20. Junkers Flugzeug-und Motorenwerke G.m.b.H., Munich.
21. Merckle Flugzeugwerke AG, Odheim, near Heilbronn.
22. Alfons Pützer KG, Bonn.
23. Raab Flugzeugbau G.m.b.H., Karlsruhe.
24A. Rhein-Flugzeugbau G.m.b.H., Krefeld.
24B. Rhein overhaul and assembly base and airfield, München-Gladbach.
25. Schemp-Hirth OHG, Kirchheim-Teck, near Stuttgart.
26. Scheibe Flugzeugbau G.m.b.H., Dachau.
27. Flugzeugbau Alexander Schleicher, Poppenhausen.
28. Stark Flugzeugbau KG, Minden.

1---12 RESEARCH ESTABLISHMENTS

1. DFL, Trauen.
2. DVL, Berlin.
3. DFL, Brunswick.
4. AVA, Göttingen.
5. DVL, Essen-Mülheim.
6. DVL, Aachen.
7. DVL, Cologne-Wahn.
8. DVL, Bonn.
9. DSH and FPS, Stuttgart.
10. DVL, Freiburg.
11. DVL and DFS, Munich.
12. DVL, Oberpfaffenhoven.

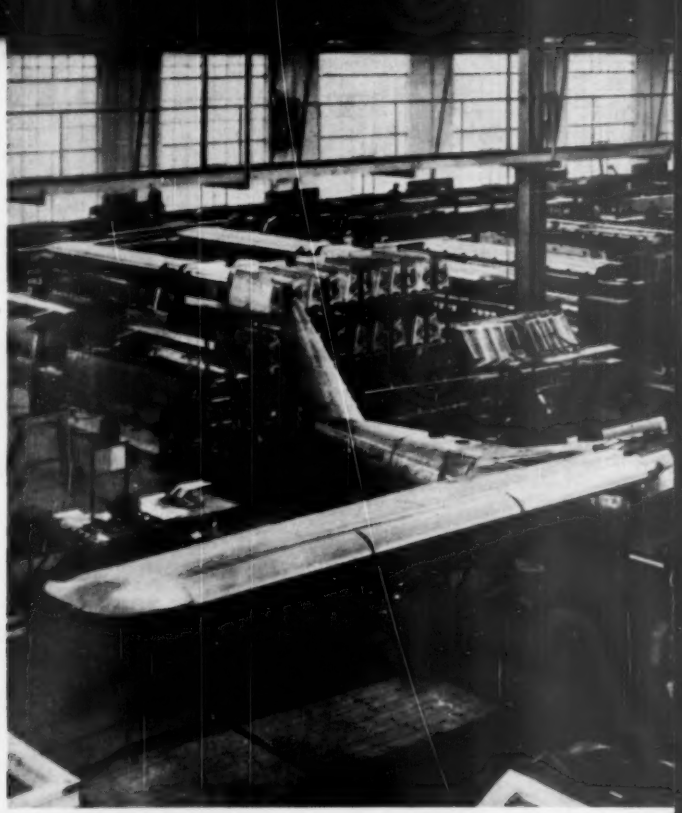
Information about these research establishments is given on page 165, the aircraft, engine and missile companies are described on pages 166 and 167.

NUMBERS REFER TO THE MAP OPPOSITE

Industry at Work

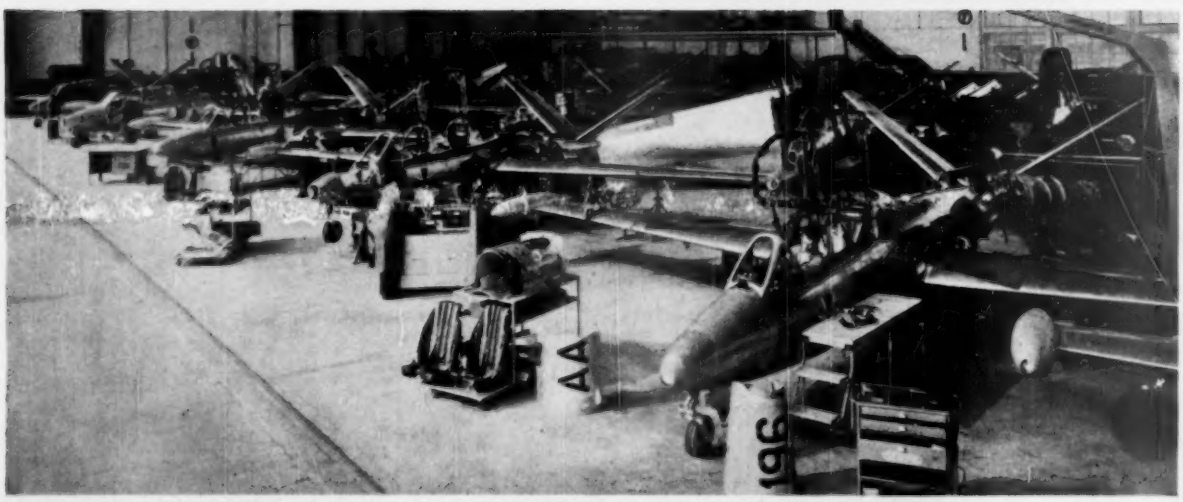
Map copyright "The Aeroplane and Astronautics"

Germany's Aircraft Industry . . . .



DORNIER Do.27s.—At Neuaubing near Munich the production of 428 Do.27s for the German Forces is nearing completion.

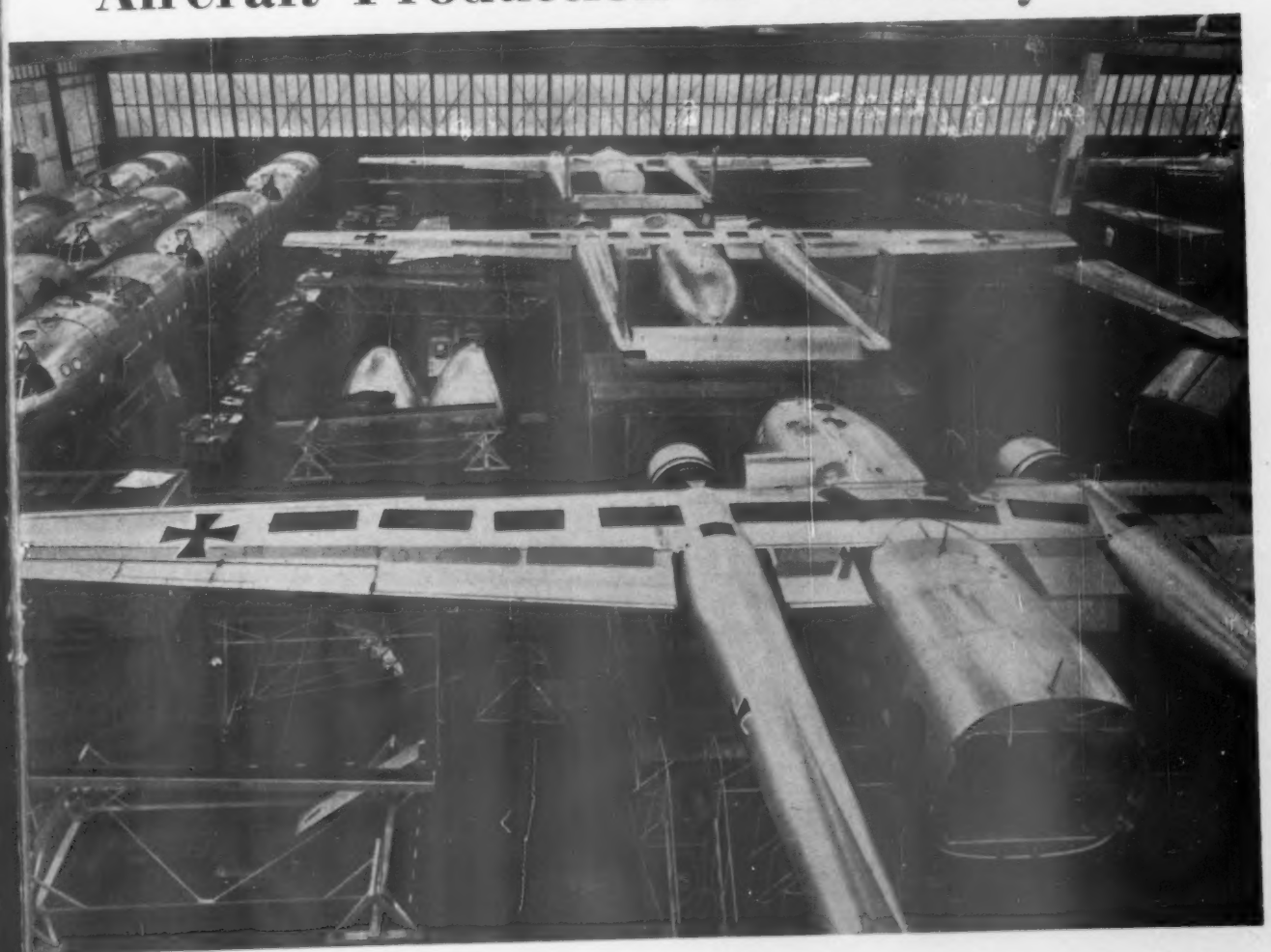
FOUGA MAGISTERS. — Heinkel and Messerschmitt work together as Flugzeug Union Sud to produce 244 Magister jet trainers; the aircraft shown are being assembled by Messerschmitt at Munich-Riem airport.



PIAGGIO P.149s.—Left, at Bremen Focke-Wulf are building 190 Piaggio piston-engined trainers; 120 have already been delivered.

NORD NORATLAS.—Right, Hamburger, Weser and Siebel are grouped as Flugzeugbau Nord to produce 112 Noratlas transports; more than half of these have been delivered. At Hamburger (right) fuselages are built and the aircraft are assembled and test-flown.

Aircraft Production in Germany



Germany's Aircraft Industry . . . .

(*Continued from page 160*)

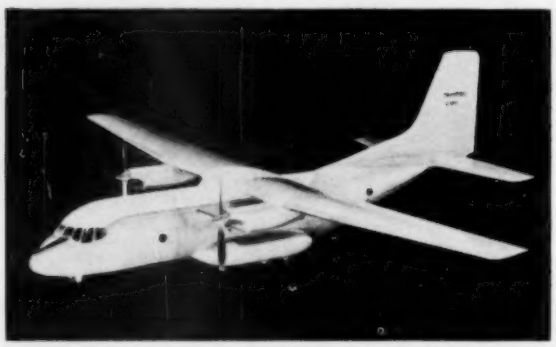
P.149 and the Dornier Do.27 was chosen for production under licence.

Later, decisions on Luftwaffe equipment have included the licensed production of the Fiat G.91 ground-attack fighter and the Lockheed F-104G Starfighter, as well as the General Electric J79 turbojet engine.

Composition and Work

Although the German aircraft industry only employs 20,000 people (last published figure), it has a multiplicity of companies and a range of working groups, or *arbeitsgemeinschaft*, on the lines of the de Havilland-Fairey-Hunting group in this country which is to develop the Airco D.H.121. Design teams from various firms also work together on major projects.

The so-called northern group, Flugzeugbau Nord, represents the collaboration for production of the Noratlas. It is a grouping only for the production of this aircraft and there are no financial links between its composite companies. These are



TRANSALL C-160.—This two-Tyne military transport will be developed jointly by Hamburger, Blume and Weser in Germany and Nord in France.

Weser Flugzeugbau at Bremen, Hamburger Flugzeugbau at Hamburg and Siebel-Werke which is, in fact, in the south at Donauworth. Noratlas production is at the rate of four a month; 112 aircraft are on order and some 70 have been delivered.

The major project of the northern companies is the Transall C-160, a military transport with two Rolls-Royce Tyne turboprops which has been designed to replace the Noratlas. It is being developed jointly by France and Germany; the companies involved are Nord Aviation, in France, and Weser Flugzeugbau, Hamburger Flugzeugbau and Blume in Germany. The government-to-government agreement to develop this aircraft was signed last December, the design had been finalized earlier last year.

The first Transall prototype will be assembled and test-flown by Nord; it is expected to fly in mid-1962. According to a German report, the second and third prototypes will be assembled at Bremen and Hamburg respectively.

The four companies are collaborating both on Transall design and production, but from the fact that Nord Aviation is to assemble the prototype it must be assumed to be co-ordinating the work. One German report states that Nord will be responsible for the wing and nacelles, Weser and Hamburger for the fuselage and Blume for the tail. A production run of about 150 aircraft is expected.

The other main company in the north is Focke-Wulf at Bremen, which is not in any production or design group. Its main effort is licensed construction of Piaggio P.149 four-seat piston-engined trainers at the rate of six a month; of the 190 on order, 120 have been delivered. Herr Eggers, the company's technical director, worked with SNECMA on the Coleopter but states that, contrary to reports, Focke-Wulf is not concerned with Coleopter development.

In the south of Germany there is a confusing range of links between companies, three for production and one for design. Flugzeug Union Sud is the name for the collaboration between Heinkel, at Speyer, and Messerschmitt, at Augsburg and Munich, on Fouga Magister production. This runs at 10-15 a month and 244 of these aircraft will be produced in all. So far 157 have been delivered.

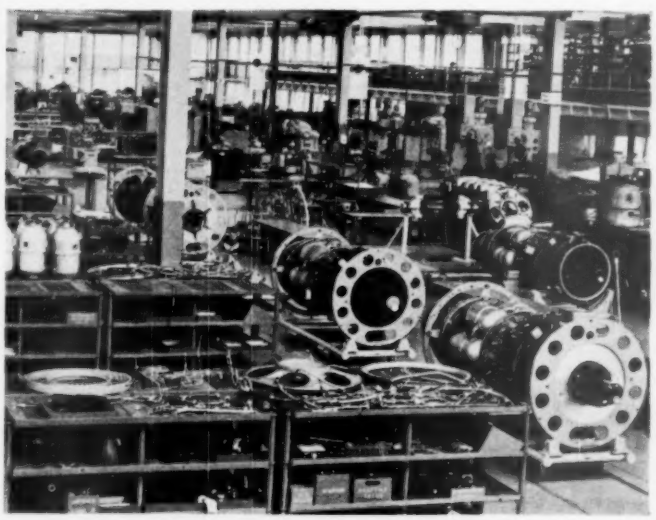
For Fiat G.91 production there is an *arbeitsgemeinschaft*, or working group, involving Heinkel, Messerschmitt and Dornier, which has its factory at Munich. It is anticipated that 232 aircraft in all will be built, although 150 is the official figure. Jigs are nearing completion and production begins in a couple of months.

The Starfighter will be built by an *arbeitsgemeinschaft* of Heinkel, Messerschmitt, Dornier and Siebel. The initial order is for 210 aircraft, which can be produced at eight a month, but it is probable that up to 564 will be produced under licence by Germany. Starfighters may also be built in collaboration with Holland for the R.N.A.F.

As well as working on the G.91 and Starfighter, Dornier is building 428 Do.27s, of which about 350 have been delivered. It is also producing 60 additional Do.27s and the Do.28—in effect a twin-engined Do.27—for the civil market, and has built a STOL research aircraft, the Do.29. This company is in the group producing NATO's maritime reconnaissance aircraft.

It appears that the major project of the southern companies is a VTOL fighter being designed in Munich by a group known as the Entwicklungsring Sud. This group combines design teams from Heinkel and Messerschmitt with an armament and electronics team from Bölkow, the missile company. Not much is known about this aircraft, but it will apparently be engined by the RB.153, a development of the Rolls-Royce RB.145 to be produced in Germany by MAN. The aircraft is apparently known in the German industry as the "dream" fighter.

There is a government-to-government agreement between Britain and Germany to co-ordinate VTOL aircraft research and development; the companies involved are Shorts and Hawker in Britain and Messerschmitt and Heinkel in Germany. But no confirmation is obtainable from the concerns named in this country. The ultimate aim is the development of a VTOL fighter and strike aircraft for NATO. The Hawker P.1127, still a Hawker Siddeley private venture, appears to be nearer the



BMW OVERHAUL.—Orenda 14 turbojets are overhauled in this section of the BMW plant at Munich. The company also builds 270-b.h.p. Lycoming piston engines under licence and is tooling up to produce General Electric J79 turbojets.

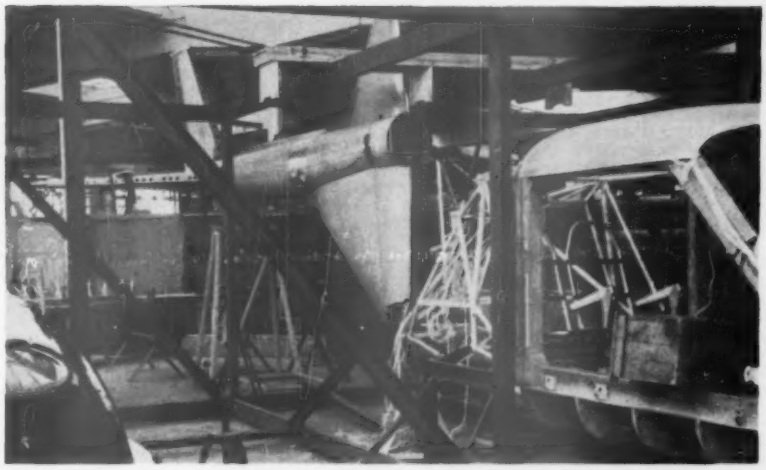
flying stage than other projects in this field. Last July Mr. Aubrey Jones, then Minister of Supply, said that he was going to place a design-study contract for this aircraft.

On the engine side the major German company is BMW Triebwerkbau at Munich, which produces under licence the 270 b.h.p. Lycoming engine for the Dornier Do.27 and the Piaggio P.149. It will also build the General Electric J79 for the Starfighter.

Two companies associated with British engine manufacturers are MAN Turbomotoren at Munich which, as mentioned, is collaborating with Rolls-Royce, and Klöckner-Humboldt-Deutz at Cologne, which will produce under licence the Bristol Siddeley Orpheus for the G.91. Interestingly, both these companies have not previously produced aero-engines.

The major German missile company is Bölkow-Entwicklugen, which has its development centre at Ottobrunn near Munich. It produces the Cobra wire-guided anti-tank missile and is also developing other missiles. This company is apparently working on an anti-tank missile likely to be adopted by Britain.

After his recent visit to Bonn Mr. Watkinson, the British



STOL PROTOTYPE.—At Krefeld, Rhein-Flugzeugbau is building a prototype of its RF-1 six-seat STOL transport (right). A test model, without outer wings and tailboom, shows how the RF-1 combines a channel wing with a ducted four-blade pusher propeller. The aircraft is powered by two 270-h.p. Lycoming engines buried in the wings.

Defence Minister, said that Britain might adopt a German missile of this type. He also said that the two countries would collaborate in developing the Blue Water SSM and would advocate its adoption by NATO. The initial version of this corps-support missile is being developed by English Electric; presumably Anglo-German collaboration will be on a later version capable of replacing the Honest John, Corporal and Sergeant SSMs.

There has been a progressive relaxation of the restrictions on German arms production; in October last year the Council of the Western European Union removed surface-to-air and air-to-air missiles from the list of weapons forbidden to Germany. It is expected that the Hawk SAM and the Sidewinder AAM will now be produced in Germany, the Hawk probably by Bölkow. The company which may produce the Sidewinder is the Bodenseewerk Perkin-Elmer.

The companies described form the "heavyweight" section of the Germany aircraft industry, but there are various companies which service and overhaul military aircraft or produce light aircraft or sailplanes.

One of the most interesting of these is Rhein-Flugzeugbau at Krefeld, which overhauls Pembrokes and Djinns and produces the Multoplane two-seat light pusher aircraft. In addition this company is building the prototype of a six-seat STOL aircraft, the RF-1.

Civil Projects

At the Hanover Fair last year Herr Frydag, secretary of the Bundersverband der Deutschen Luftfahrtindustrie, said that the industry hoped to take up the design and construction of transport aircraft. A short or medium-range transport with turboprop or gas-turbine engines was under consideration. A range of designs had been studied and two selected for further development.

In October the West German Economics Ministry was reported to have drafted a bill to allow for the manufacture of a German medium-range aircraft. It was stated that two designs had been chosen for development from the 13 submitted and that the Ministry suggested that DM 60 million—about £5 million—should be provided for their development.

These two designs appear to be the Hamburger Flugzeugbau HFB 314, an 80-seat jet transport, and the Heinkel He.211, a twin turboprop STOL transport seating 23 people. During a visit to Hamburger it was stated that their project had been shelved, so that the He.211 probably remains the only live design.

As already mentioned, the prototype of much smaller STOL transport, the RF-1 is being built by Rhein-Flugzeugbau at Krefeld. A six-seater, it is powered by two 270 h.p. Lycoming engines, buried in the wing. They drive a single ducted pusher propeller, behind the cabin. A channel wing forms the lower part of the propeller duct, in which there are slipstream deflection flaps. Its take-off and landing runs are expected to be a little over 100 yards. First flight will be in April.

Research

Aeronautical research in Germany was forbidden between 1945 and 1955; it was resumed under difficulties similar to those which affected aircraft construction. A range of bodies are responsible for research; they are the universities, the technical universities, special research establishments and some institutes of the Max-Planck-Gesellschaft. This organization has 40 institutes in the Federal Republic which are responsible for basic research in many fields.

The universities, technical universities and Max Planck institutes employed 587 people on aeronautical research in 1958, but this total includes all employees and not merely the scientific personnel. University work, which is mainly basic research, is concentrated at Aachen and Stuttgart; but other centres involved are Berlin, Brunswick, Darmstadt, Hanover, Karlsruhe and Munich.

The six independent research establishments, usually known by their initials, are in order of age AVA, DVL, DFS, DFL, DSH and FPS. Details of these bodies and the number of people they employed in March, 1959, are given below:—

AVA: Aerodynamische Versuchs-Anstalt (Aerodynamic Testing Establishment) at Göttingen employs 114 people.

DVL: Deutsche Versuchsanstalt für Luftfahrt (German Testing Establishment for Aviation) has establishments at Aachen, Berlin, Bonn, Cologne-Wahn, Essen-Mülheim, Freiburg, Munich and Oberpfaffenhoven. The largest German research body, it has 512 people.

DFS: Deutsche Forschungsanstalt für Segelflug (German Research Establishment for Gliding) based at Munich has 58 people.

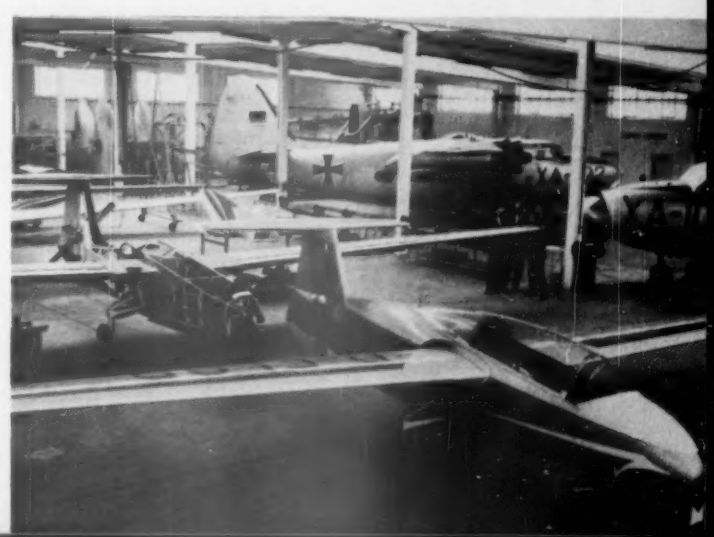
DFL: Deutsche Forschungsanstalt für Luftfahrt (German Research Establishment for Aviation) employs 291 people at Brunswick and Trauen.

DSH: Deutsche Studiengemeinschaft Hubschraube (German Helicopter Study Group) employs 23 people at Stuttgart.

FPS: Forschungsinstitut für Physik der Strahlantriebe (Research Institute for the Physics of Jet Propulsion) based at Stuttgart employs 41 people.

The DSH and FPS were founded in 1953 and 1954 respectively, but the other bodies were formed before the War and have resumed their research activities.

In 1959 the six research establishments formed a joint association, the Deutsche Gesellschaft für Flugwissenschaften (German Association for the Aeronautical Sciences) to co-ordinate financial planning and present an overall programme to the agencies which provide funds. Also represented in this association are two German aeronautical bodies.



RHEIN-FLUGZEUGBAU.—At its München-Gladbach airfield the Rhein company assembles RW-3 Multoplanes and overhauls Hunting Pembrokes.

Germany's Aircraft Industry . . .

Money for research is provided by the eight ministries of the Federal and Länder governments—mainly the ministries of defence, transport, economics and education—as well as by the German Research Board, which itself receives Federal Government finance to promote scientific research.

In the year ended March 31, 1959, the universities and technical universities received DM 23.1 million to provide research facilities and DM 9.3 million for operating expenses. The research establishments received DM 17 million for facilities and DM 13.5 million for operating costs.

The overall total was thus DM 62.9 million (£5.4 million). It is planned to double this expenditure and the number of people concerned in research—which was 1,626 in 1959—over the next few years.

At present effort is being concentrated on building new test facilities particularly for high-speed research. One of the most important research centres will be at Cologne-Wahn, where the foundation stone of a new DVL centre was laid last July.

Exports

The German industry has made considerable efforts to export its products, despite the handicap of the years when its competitors were able to build up both overseas sales and service facilities, as well as the prestige of their products.

So far German exports have not been on a large scale, but they are likely to increase. Dornier has been one of the most successful companies; in addition to Bundeswehr orders it has sold 60 Do.27s, most of them for export, and another 50 of these aircraft are being built under licence in Spain by CASA.

Other important exporters are Rhein-Flugzeugbau, which has sold some 20 RW-3 Multoplanes abroad, and the sailplane companies Scheibe at Dachau and Alexander Schleicher at Poppenhausen. Each of these companies has exported more than 200 sailplanes since 1952.

Prospects

The northern units of the German industry seem likely to run out of aircraft to build before their major project, the Transall, reaches the production stage. They may possibly be given some Starfighter orders; so far only 210 of these aircraft have been ordered from the southern companies. These are much better placed; current orders for the G.91 and Starfighter should keep them busy for about three years. If their major project, the "dream" fighter, goes into production they will have more work to follow.

The southern factories will tend to increase their personnel, but in some cases will do so only at the expense of their non-aeronautical output. There seems to be an inclination in the industry—in fact almost an unofficial directive—against expansion above its present size. Germany has no wish to face the difficulties of British and U.S. industries, which are reckoned to stem mainly from their size.

As for future developments, there appears to be not the slightest inclination to "go it alone." Those to whom I talked favoured the international development of aircraft to ensure reasonable costs and to allow economic production runs. They felt that there was an unacceptable waste of human and financial resources if individual countries developed their own aircraft—and that the time for "go-it-alone" design and production policies was over.

Certainly the German aircraft industry has close present ties with those of France, Italy and America, while its relationship with Britain's industry is growing closer, as evidenced by licensed production of the Orpheus, agreements with Rolls-Royce and future collaboration between the two countries on missiles and VTOL aircraft. British suppliers of engines and airframe equipment will also benefit from the Franco-German Transall transport and other German projects.

Germany now has an aircraft industry tailored to meet current needs and not, as with Britain and the U.S., one which is over-large as a legacy of wartime needs and post-war rearmament. It thus benefits from the very handicap of returning to aircraft production only five years ago. In providing aircraft for a purely tactical air force it is protected to some extent from the missile mania which has so drastically affected the British and American industries. And even if the German companies do face a recession when G.91 and Starfighter orders run out, they have been built up from the start on a diversified basis. Most have kept a stake in the industrial activities which they followed before 1955.

The Industry Summarized

German aircraft, engine and missile companies are listed alphabetically below in two groups. Companies in the first are concerned with production of military aircraft, missiles or engines. The remainder are in the second.

GROUP 1

BMW Triebwerkbau G.m.b.H.—The major German aero-engine company. Builds the 270-b.h.p Lycoming GO-480-B1A6 piston engine which powers the Dornier Do.27, Do.28 and Do.29, and the Piaggio P.149 trainer. Also overhauls Orenda 14s for Luftwaffe Sabres.

Tooling up to produce General Electric J79 engines for F-104G fighter. A 70-h.p. shaft turbine to be used mainly as an industrial unit has been developed; it is reported that General Electric has a licence to produce this unit in the U.S.

BMW Triebwerkbau is a subsidiary of the Bayerische Motoren Werke AG which produces cars and motorcycles. During the War BMW employed 56,000 people on aero-engine production; by 1945 nearly 1,500 BMW 003 turbojets had been delivered.

The BMW aero-engine plant at Munich survived the War virtually unscathed. When aero-engine work was resumed part of the works was sold to MAN. Only 150 people were then employed, but of the 1,150 employed today many are working on industrial and fighting-vehicle engines. As J79 production builds up it is expected that the work force may rise to 2,000.

Research and development group, formed by BMW Studiengesellschaft für Triebwerkbau G.m.b.H., was absorbed in 1957. A small turbofan is at present being studied but no decision has yet been made on its development.

Bodenseewerk Perkin Elmer and Co. G.m.b.H.—Uberlingen on Lake Constance. This company will probably produce the Sidewinder AAM under licence.

Bölkow-Entwicklungen KG.—Ottobrunn near Munich. This versatile company is concerned mainly with the development and production of anti-tank missiles. Its Cobra lightweight wire-guided missile is in production.

Armament and electronics team at Munich is working as part of the Entwicklungsring Sud on the VTOL "dream" fighter. Interests in future may include the Hawk SAM and Blue Water SSM.

Bölkow has 600 people at its Ottobrunn development centre and another 300 at factories at Nabern near Stuttgart and Augsburg. It has expanded fast since it was founded in 1956 and will probably continue to do so.

Apart from its major interest in missiles and electronics, Bölkow has developed the Bö 102 Heli-Trainer, of which five are on order for the German Army. This is being developed as a true helicopter as a private venture. An 85-h.p. piston engine is to be installed in this version, the Bö 103.

Bölkow also builds the Klemm 107C two-seat monoplane, a powered version of the French Fauvel tailless glider and the Bölkow Phönix high-performance sailplane.

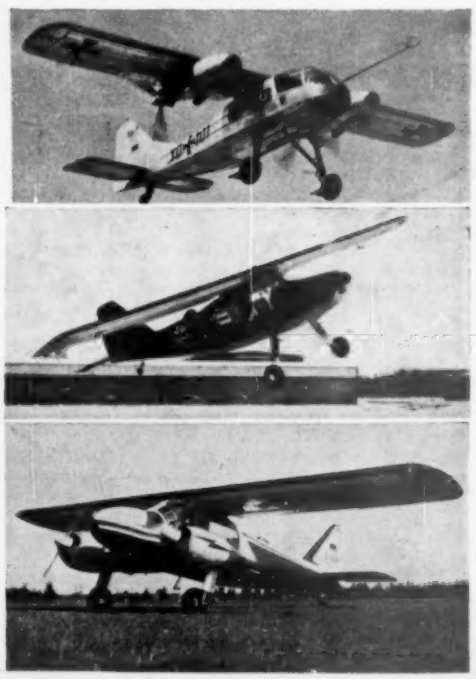
Dornier-Werke G.m.b.H.—Only company in Germany producing a military aircraft of German design, the Do.27; 428 on order for German Army, some 350 have been delivered. The Do.25, from which the Do.27 was developed, was designed and produced in Spain before aircraft production was permitted in Germany. An additional 60 Do.27s have been ordered, mostly for export.

Ten twin-engined civil Do.28s (two 180 h.p. Lycomings) are now being produced.

Two Do.29 STOL research aircraft have been produced and a third is being built. These aircraft, with pivoting engines driving pusher propellers, have been developed jointly by Dornier and the DVL for the study of VTOL and STOL problems. A STOL design study attributed to the company is a close-support transport powered by Bristol Siddeley lift-thrust engines.

Production of the Do.27 for the German Forces will end this summer; it will be succeeded by production of the rear fuselage, tailplane and elevators for 150 G-91s

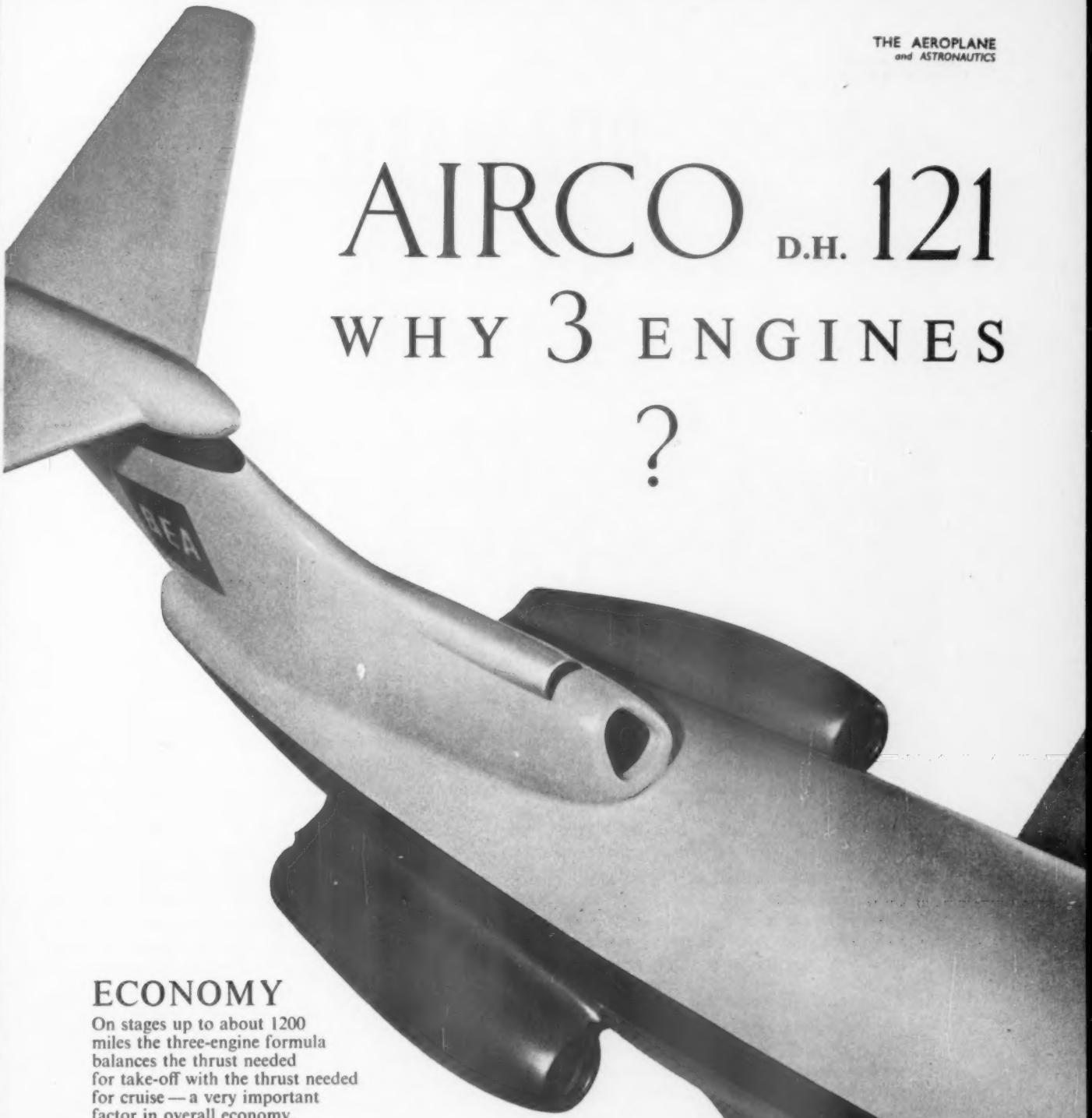
(*Continued on page 167*)



DORNIER TYPES.—Three post-war aircraft designed by Dornier are (top to bottom) the Do.29 STOL/VTOL research aircraft, the Do.27 which is produced in both military and civil versions, and the twin-engined civil Do.28.

AIRCO D.H. 121

WHY 3 ENGINES ?



ECONOMY

On stages up to about 1200 miles the three-engine formula balances the thrust needed for take-off with the thrust needed for cruise — a very important factor in overall economy.

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Canadair's Forty Four, offers a simple, practical answer to these vital questions. It is an optimum-size, all-new, all-cargo turbo-prop airplane that, in terms of productivity, is vastly superior to converted piston engine equipment, and one that offers, in comparison with the big jets, a payload capacity that is not unrealistically high for profitable operations during the 1960's. Furthermore, the Forty Four suffers little or no operating penalties due to runway limitations, and there will be no community noise problems.

The Canadair Forty Four has a productivity two to three times that of converted piston aircraft, at the same cost per airplane mile, and has a profit potential that will quickly recover any losses on disposal of piston engine aircraft now being used or contemplated for cargo usage. On the other hand, the Forty Four with a payload capacity of 65,000 lbs. and low break-even point is ideally matched to the natural expansion of the cargo market and will begin immediately to operate at profitable load factors.

The Canadair Forty Four is flying now and is in production for the three largest all-cargo carriers in the United States, and can be introduced into existing fleets as early as January 1961.

The Canadair Forty Four can operate in and out of all airports presently used by four-engined piston-powered aircraft. For example, at such an important airport as Midway, in Chicago, with only 6400' runways, the Forty Four can take off with 90% of its maximum payload and fly non-stop to San Francisco.

Sophisticated design features, including swing tail and integral cargo handling equipment, slash direct and indirect costs.

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Thus General Dynamics Corporation's Canadian subsidiary, Canadair, the specialist in air cargo, proposes the Forty Four as the answer to air cargo's biggest dilemma.

Principal Features of the Canadair Forty Four

1. Low prime cost—less than ⅔ the price of proposed jets.
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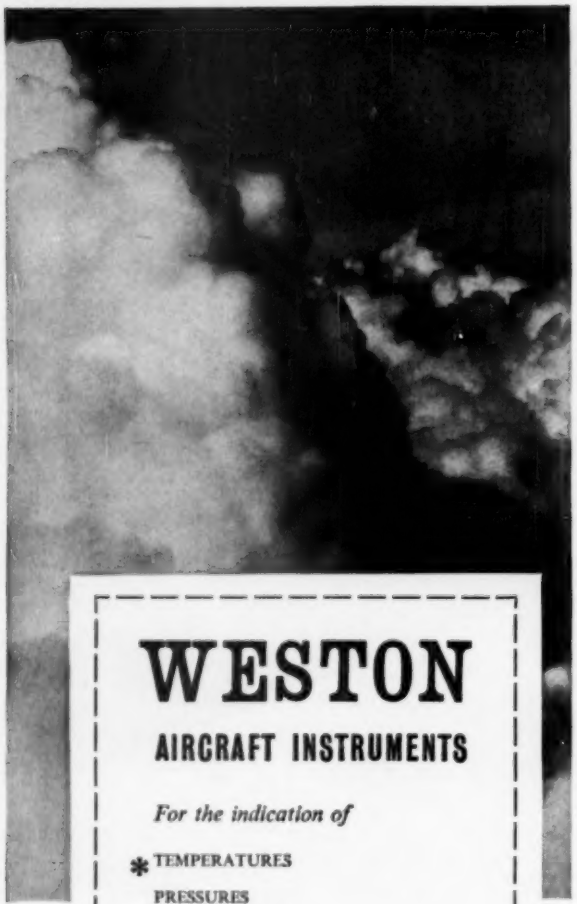

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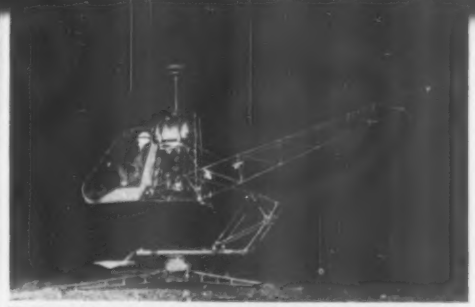


BÖLKOW DIVERSITY.—The Bo 102 Heli-Trainer, the Phönix high-performance sailplane and the Cobra anti-tank missile are three products of Bölkow-Entwicklungen, the leading German missile company.

(*Continued from page 166*)

as well as the centre fuselage for 210 F-104Gs. Dornier will also produce the rear fuselage and tail of the Breguet 1150, the NATO maritime-reconnaissance aircraft.

Head office and design department are at Friedrichshaven. Factory is at Neuaubing near Munich; assembly shops and airfield at Oberpfaffenhoven. Here it will assemble and test-fly G-91s, and overhaul Sabres and Vertol H 21s.

The company employs 2,000 people in all.

Focke-Wulf G.m.b.H.—Bremen-Flughaven. Now producing Piaggio P.149 trainers under licence at six a month. Production to total 190, of which 120 have been delivered. In addition, Germany bought 72 direct from Piaggio. Also responsible for servicing and overhaul of Sea Hawks, Gannets and Albatross for German Navy.

1,000 people are employed, about one-third on aircraft production, one-third on aircraft overhaul and one-third on industrial work.

In 1951 company took up production of Weihe and Kranich 3 sailplanes, now discontinued. The company built the first German all-metal aircraft to be designed after the War, the Blume 500. Prof. Blume designed the Piaggio production jigs for the company, but he is not at present associated with Focke-Wulf.

Possible production of the Fairey Rotodyne and of the Short Seacat naval SAM has been reported.

Hamburger Flugzeugbau G.m.b.H.—Aviation section of Blohm and Voss. Main factory and airfield at Hamburg-Finkenwerder. Fuselages for Noratlas are produced and aircraft assembled and test-flown. Noratlas fuselage sub-assemblies are built in another factory at Stade. About 2,000 people are employed.

As member of Flugzeugbau Nord group main activity is Noratlas production. A total of 112 aircraft is being produced at the rate of four a month; deliveries will be completed early in 1961.

Major project is the Transall C-160; company forms part of the Franco-German group which will develop this aircraft. According to German report, the third Transall prototype will be assembled by Hamburger at Finkenwerder.

Ernst Heinkel G.m.b.H.—Speyer. Magister nose, wing and tail units are built. Linked with Messerschmitt in the Flugzeug Union Süd group for Magister production. Also member of other two working groups which will produce the G.91 and the Starfighter. Design team of 110 people forms part of the Entwicklungsring Süd in which it is linked with Messerschmitt and Bölkow. Purely Heinkel designs such as the He.211 STOL transport have also been evolved.

The company employs 1,000 people.

Heinkel will produce wing, fin, rudder and fuselage nose for G.91, also wing and tail unit for Starfighter. They stated that G.91 orders would total 232 aircraft in all, not 150, and 210 Starfighters were to be built. G.91 production begins this month, Starfighters six months later. Possible production rates, eight per month for the Starfighter combined with seven per month for the G.91.

Cessna L-19s are overhauled for U.S. Army.

Ernst Heinkel AG.—Stuttgart. Overhauls Turboméca Marboré 2 engines for Magister trainers. It is also reported to have delivered in 1956 a 6,500-lb. thrust aero gas turbine, the He-S-053, ordered by a foreign buyer.

Klöckner-Humboldt-Deutz AG.—Cologne. Will produce the Bristol Siddeley Orpheus 803 under licence to power the G.91. Founded by Dr. Otto, the company produces a wide range of industrial power plants; it is also developing industrial gas turbines.

MAN Turbomotoren G.m.b.H.—Munich. Subsidiary of MAN group and has a technical collaboration agreement with Rolls-Royce. According to reports, it is to develop RB.153 lightweight high-thrust turbojet, probably for German VTOL fighter project.

Messerschmitt AG.—Works at Augsburg and assembly shops at Munich-Riem airport. Employs about 1,600 people.

Linked with Heinkel in the Flugzeug Union Süd for Magister production, it builds the fuselage and is responsible for assembly and test flying at Munich. In all, 188 German-built Magisters are being produced; an additional 22 came from France for final assembly and another 34 were built from French parts.

Messerschmitt will produce the front fuselages of the G.91 and of the Starfighter. It will also assemble and test-fly Starfighters; this may be done at Stuttgart rather than at Munich. Here also T-33 trainers are overhauled.

Messerschmitt design staff forms part of the Entwicklungsring Süd design group at Munich, which is reported to be designing a VTOL fighter.

Siebelwerke ATG G.m.b.H.—Donauworth in Bavaria. Is member of both northern and southern working groups.

As member of Flugzeugbau Nord it produces fins, rudders, tailplane and elevator for the Noratlas. Also associated with Dornier, Messerschmitt and Heinkel in production of Starfighter, for which it will build the rear fuselage.

Weser Flugzeugbau G.m.b.H.—Largest of northern companies, has headquarters in Bremen. United Aircraft Corp. (U.S.A.) own a 43% interest. Weser employs about 3,500 people on aircraft design, construction and overhaul. Factories at Lemwerder and Einswarden. Third factory at Varel, owned by a subsidiary, produces jigs and tools.

Production concentrated on Noratlas. Weser is responsible for tail-booms, wing centre-section, nacelles and engine installation. Company also overhauls F-84F and RF-84F aircraft for the Luftwaffe, about 50% of its personnel being engaged on this work.

KLEMM TOURER.—Production of the Klemm 107C light aircraft is handled by Bölkow.

Main project is the Transall C-160; it is associated with Nord, Blume and Hamburger in developing this transport.

GROUP 2

Aero Flugzeugbau Hubert Zuerl.—Munich. Plans and kits for amateur construction of French Jodel D.9 and D.11 light aircraft, re-engined and adapted to meet German airworthiness requirements. Complete aircraft also supplied.

Prof. Dipl.-Ing. W. Blume Leichtbau und Flugtechnik G.m.b.H.—Duisburg. Apparently acts mainly as a design organization. Its prototype Blume 500 four-seat tourer aircraft was built by Focke-Wulf. Blume also designed jigs for Focke-Wulf production of Piaggio trainers. Blume forms part of group developing the Transall C-160 transport.

Carl F. W. Borgward G.m.b.H.—Bremen. This motor company has produced a prototype of the Kolibri three-seat helicopter, designed by Prof. Dr.-Ing. E. H. Focke, the first German-designed helicopter to fly after the War.

Burgfalke Flugzeugbau.—Burglenfeld, near Regensburg. Developing a two-seat pusher monoplane, the M-150 Schülmeister. Also produces Scheibe and Vogt sailplanes.

Daimler-Benz AG.—Stuttgart. No aircraft engines at present produced by this company. It has an agreement with Curtiss-Wright covering the overhaul and possible licence production of Curtiss-Wright engines in Germany.

Möwe-Flugzeugbau Heini Dittmar.—Augsburg. Has produced Dittmar Möwe two-seater (90 h.p. Continental).

Henschel Flugzeugwerke AG.—Kassel. Responsible for overhaul of Sud Alouette helicopters operated by German Forces.

Junkers Flugzeug und Motorenwerke G.m.b.H.—Location unknown. Intends to develop aircraft power units, but does not produce aircraft or engines at present.

Merckle KG Flugzeugwerke.—Odheim near Heilbronn. Developing the five-seat Merckle SM 67 helicopter (Artouste shaft-turbine), for the Federal Defence Ministry. First prototype was damaged last August, but another is being built. Also assembling 60 Agusta Bell 47G helicopters for German Services.

Alfons Pützer KG.—Bonn. Produces the Pützer Elster, a monoplane two-seater (52 h.p. Porsche).

Raab Flugzeugbau G.m.b.H.—A well-known name in German pre-war aviation. Formed at Karlsruhe early in 1959, Raab plans to produce the Italian M.d.B. Aeroscooter ultra-light monoplane. Also holds licence and sales rights for Ambrosini Rondone four-seater.

Rhein-Flugzeugbau G.m.b.H.—Factory is at Krefeld and airfield at München-Gladbach. Produces under licence the RW-3 Multoplane; most of its production has been exported. Pembrokes and Djinn helicopters are overhauled for the German Services. Prototype of the RF-1, a six-seat STOL transport powered by a ducted pusher propeller, is being built. About 200 people are employed.

Schemp-Hirth O.H.G.—Kirchheim-Teck near Stuttgart. Developing the Milan GS-6, a two-seat monoplane tourer with 105-h.p. Walter Minor.

Scheibe Flugzeugbau G.m.b.H.—Dachau. Well known for its series of Bergfalke, Spatz and Zugvogel sailplanes. It also produces powered aircraft; the Scheibe Sperling two-seat high-wing monoplane (95 h.p. Continental) has been produced at the rate of two a month since September, 1958. It has also built the Motorspatz powered sailplane.

Flugzeugbau Alexander Schleicher.—Sailplane construction was resumed by this company in 1951; pre-war production began in 1927. Current sailplanes are the Ka 6B Rhönsegler, the Rhönlerche 2 and the K7 Rhönadler.

Stark Flugzeugbau KG.—Minden. Stark produces the Druine Turbulent ultra-light single-seater under licence.

Astronautics and Missiles

Russian Progress in Space Research

RECENT developments in the U.S.S.R. suggest that scientists there are looking towards a whole new series of experiments with artificial satellites and space-probes. Not only were the Soviet delegates to the recent Cospar meeting in Nice unusually frank about future prospects, but the Pacific test-firings of a new and more powerful space-booster are a clear indication that Russian scientists are preparing for a "second generation" of space exploration.

The development of a nose-cone which apparently remained intact after travelling 7,760 miles and reaching a maximum speed of 16,150 m.p.h., not only suggests that the Russians have solved the re-entry problem for ballistic missiles, but they have also come some way in producing a re-entry nose-cone for space-flight.

After the initial firing on January 20, Prof. Boris Konstantinov, director of the Physical and Technical Institute of the U.S.S.R. Academy of Sciencies, made these comments to a *Tass* reporter:—

"First, the discrepancy between the target and the point where the nose-cone, simulating the last stage of the rocket, hit the water represents only 1/6,000th part of the total range. Secondly, the two-way radio communication was maintained throughout the trajectory, including transit through the dense layers of the atmosphere over the target area. Thirdly, the thermal shield of the nose-cone fully protected it from destruction while it was moving at immense speed in the lower layers of the atmosphere. And lastly, a heavy satellite can carry a device making possible a safe descent through the whole atmosphere to the point of landing."

Writing in *Sovietsky Flot*, N. Varvarov also drew attention to the problem of recovering rocket vehicles. In order to control the frictional heating that normally destroys a satellite which re-enters the atmosphere, the rocket's descent must be made as protracted as possible.

"This means that the rocket should circle the Earth several times before reaching the surface. [Here the writer implies a lifting vehicle.—ED.] In addition, it must be borne in mind that its smooth ground-controlled descent, within the pre-arranged area, is impossible without continuous tracking. For this purpose there must be tracking stations not only on land but at sea as well. The initial experiment has shown that the use of shipping for this purpose is indispensable."

Tass had reported that: "The nose-cone of the last stage of the rocket was tracked during its flight in the atmosphere and its contact with the water was recorded by the ships' radar and optical and acoustic installations . . . they also made valuable telemetric measurements of the flight trajectory as the rocket came down."

Thus, if recovery of satellites is now a principal objective, Soviet rocketry and space-research will be brought increasingly into the light of day and co-operation with other nations may be actively sought. Indeed, this tendency seemed apparent at the Cospar meeting where, as already reported, agreement was reached on the important question of radio frequencies.

This followed recommendations by the International Telecommunications Union that all satellites should operate on a frequency of 136 mc/s. Until now, Russian satellites have used 20 or 40 mc/s. and the Americans largely 108 mc/s. At Nice, there was general agreement on the new standard frequency and also with the suggestion that all future satellites should have some provision for switching off their transmitters after a year in orbit.

Atmospheric Studies

In a report placed before Cospar in January, Prof. A. A. Blagonravov outlined the principal objectives of the Soviet space programme since the beginning of the International Geophysical Year.

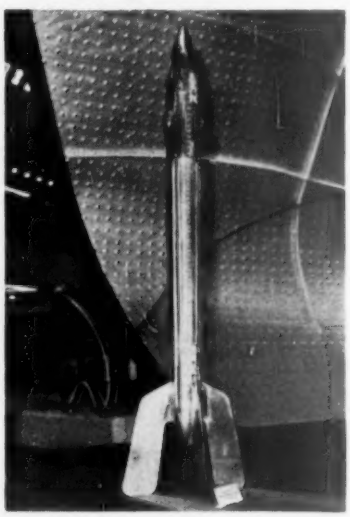
During the I.G.Y., 125 research rockets were launched in the Soviet Union in addition to the Sputniks, and 50 more were launched during 1959. Firings were made from Russian territory, in areas beyond the polar circle, in the central latitudes of the U.S.S.R., from ships in the Southern Hemisphere and in the Northern Pacific.

Since the I.G.Y., 158 meteorological rockets were sent up for the purpose of studying the stratosphere; they were equipped with resistance electric thermometers and thermal and membrane manometers. In eight launchings, the rockets were also supplied with devices for certain optical observations (the luminosity of the sky and the distribution of ozone, for example).

As a result of these observations, a great deal of information on the temperature and pressure in the stratosphere was accumulated. Preliminary analysis also gave some information on temperature fluctuations over the course of a year in the stratosphere and on the luminosity of the sky at various altitudes.

Self-orientating Containers

In the period of the I.G.Y. and during 1959, 17 geophysical research rockets were launched in European U.S.S.R. to heights of between 60 and 300 miles. In six cases the rockets were supplied for the first time with hermetically sealed, spherical, self-orientating containers provided with instruments for measuring structural parameters of the atmosphere, for carrying out optical observations and for measuring physical conditions inside and outside the container. The spherical container, complete with instruments and orientation device, weighed 809 lb.



Model of a "meteorological rocket" which the Russians claim was built by M. K. Tikhonravov in 1933 and successfully fired.

(Howard Levy photograph)

In seven cases the rockets launched, to heights of up to 130 miles, two containers and a detachable nose-cone—all containing research instruments—and a hermetically sealed cabin with animals. The total weight of the scientific equipment and animals was 4,850 lb. A parachute system ensured safe return.

In four launchings made in 1958, scientific research equipment and animals, contained in a detachable nose-cone, were taken for the first time to a height of 280-290 miles; total weight of apparatus and animals was 3,307 lb. The rocket was stabilized throughout its flight, a procedure which "considerably increases the precision and value of the work conducted." The first successful recovery from a height of 280 miles was made on August 27, 1958.

The principal results of these rocket investigations are as follows:—

(1) New data have been obtained on the pressure, density and temperature of the upper atmosphere, which has made possible the creation of a physical model of the upper atmosphere to an altitude of 280 miles.

(2) For the first time in the U.S.S.R., the chemical composition of the upper atmosphere was determined by means of radio frequency mass spectra, thereby increasing contemporary knowledge of the increase of ions in the upper atmosphere.

(3) By means of an ultra-short wave dispersion interferometer, equivalent electronic concentrations have been determined at altitudes between 62 and 290 miles. At altitudes above 240 miles, electronic concentrations have been determined for the first time. It has been established that apart from the F layer there are no strictly defined areas in the ionosphere. Only small individual electronic condensations have been

A modern Russian meteorological rocket which can ascend 60 miles. The vehicle is 23-ft. long × 17-in. diameter and at launch weighs 1,598-lb.

found against a general background of the gradual increase of electronic concentration up to the maximum of the F layer. At altitudes exceeding this layer, electronic concentration decreases.

(4) Methods and equipment permitting not only the counting of micrometeorite impacts but the determination of their energy indices have been developed and tested.

(5) Interesting data have been received on the distribution of the luminosity of the diurnal and nocturnal sky.

(6) Photographs have been obtained of the ultra-violet spectrum of the Sun, and information has been recorded on the distribution of energy in different parts of the spectrum.

(7) Experiments have been made in photographing the surface of the Earth and cloud systems from great altitudes.

(8) The height dependence of the global intensity of charged particles has been measured up to an altitude of 130 miles.

(9) Physiological observations of animals under conditions of rocket flight have been continued and extended. It has been established that the flight of animals to altitudes up to 290 miles does not cause pronounced disorders in their physiological functions. Physiological changes were particularly marked during the acceleration of the rocket and during the period of its slowing down. During periods of weightlessness lasting from six to 10 minutes, the animals' physiological condition returned to normal after five to six minutes.

The Future

Although the report has much to say also about the results obtained with the Sputniks and Moon-probes, these are more widely known and, in any case, formed the subject of Soviet papers given at the Cospar Symposium (THE AEROPLANE AND ASTRONAUTICS, January 29, pp. 140-2).

It is, however, of interest to note the trend of future developments in Soviet space-research, as envisaged by Prof. Blaganravov:—

The programme of scientific investigation by means of artificial satellites, he said, is vast. It offers the opportunity of studying the ultra-violet and X-ray spectra of the Sun and other astronomical objects. It should be possible to map the stellar sky in different parts of the spectrum, and photograph the solar corona and various nebulae.

Also important will be cosmic-ray studies, studies of the structure of the terrestrial magnetic field and its relationship with solar activity. Studies of the ionosphere and of the Earth's gravitational field will be continued, and there is the opportunity of establishing a high-precision time service for astronomical purposes.

By way of preparation for manned flights into outer space, a broad range of biological studies is being planned. The problem is posed of making a broad and comprehensive study of the effect of cosmic rays on living organisms, and of finding ways of securing protection against them. In this connection, special containers bearing plants and also "highly organized living beings" are to be sent into outer space.

In accordance with the programme of scientific investigations, the U.S.S.R. plans to launch a series of satellites.

The second stage will encompass lunar exploration and studies in the vicinity of the Moon. Later, it is hoped—on the basis of experience thus gained—to carry out a series of experiments with rockets sent to the planets, first Mars and Venus.

Instruments brought into immediate proximity with the surfaces of other planets will permit, in the near future, the solution of one of the mysteries of the World—the existence of life on other planets. In pursuing these latter objectives, studies are being made of the astronomical constants of the Solar system and of the gravitational fields.

Prof. Blaganravov's report concludes with these words:—

"In solving the problems that I have enumerated, we shall encounter tremendous scientific and technological difficulties. But we are confident that they will all be solved if the collective efforts of the scientists of many countries are united, if progress in science and technology is directed towards the solution of peaceful problems; and these include the exploration of space."

The recovered instrument container of a Soviet geophysical rocket which reached a height of 280 miles. Parachutes are deployed alongside.

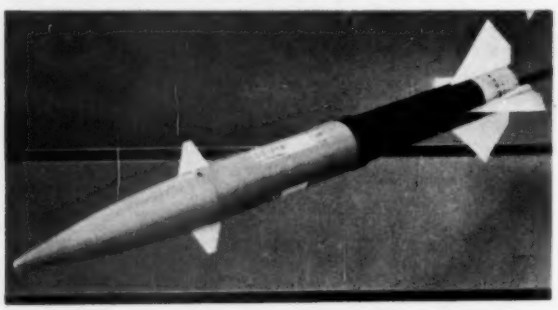
A New Target Missile

A $470,000 contract has been received by the Santa Barbara Division of the Curtiss-Wright Corporation for the manufacture of a new expendable, high-altitude, air-launched rocket powered target known as the TDU-12B Skydart 1. Used for testing air-to-air missiles and to provide inexpensive attack training for interceptor pilots, the Skydart was designed and developed under sponsorship of the A.R.D.C. Sidewinder Weapons Systems Project Office at Wright-Patterson A.F.B. It is built around a small solid propellent Grand Central rocket motor having a single chamber which provides both high-level boost thrust and low-level sustainer thrust.

The nose of the Skydart contains the roll control gyro, autopilot, and battery for electrical power. Between the nose and the head of the rocket motor is a cylindrical centre-section for accommodating various payloads such as beacon transponder, telemetry equipment, and a self-destruction device.

Adjustable canard control surfaces with a 13-in. span, which are preset for the desired trajectory in the pitching plane, are mounted on the bulkhead between the nose and the centre-section. A tail assembly is attached to the rear of the rocket motor and consists of four tail fins mounted in a cruciform arrangement to provide inherent weather-cock stability.

Roll control tabs, controlled by solenoids contained within the tail assembly, comprise the outer panels of the vertical fins. The solenoids provide proportional control through the use of dwell-time modulation which maintains zero angle of bank. A flare is mounted on the lower vertical fin to provide the infra-red source for heat-seeking missiles.



This Howard Levy photograph shows the expendable, high-altitude, air-launched rocket target, the Curtiss-Wright Skydart 1.

Launching of Skydart is achieved from standard GAR-8 launching rails on the F-100D and F-104 fighters, the missile being fired by a single "Fire" button at the discretion of the pilot. It can be launched at altitudes from 40,000 ft. to 60,000 ft. at speeds between Mach 0.8 and 2.0. Minimum target speed is Mach 0.8 and useful endurance exceeds 90 sec., while maintaining an altitude of ± 5,000 ft. from launch altitude.

Skydart 1 is in the final stage of flight evaluation; Skydart 2 is under development. The latter is generally similar to the first model except that its useful duration of flight is doubled. It is primarily intended for use with radar homing missiles and its altitude will be maintained within ± 2,500 ft. of launch altitude.

Overall length of Skydart 2 is 80 in.; its body diameter is 6.4 in.; fin span, 20.8 in. and weight, 116 lb. H.L.

Man in Space this Year?

FIRST flight of an American in a ballistic rocket will be made this summer, according to Dr. Keith Glennan, Administrator of the National Aeronautics and Space Administration. It is believed that each of the seven men under training for Project Mercury—the recoverable satellite capsule—will be launched in Redstone rockets over a distance of 200-300 miles downrange from Cape Canaveral. (The Redstone/Mercury combination was illustrated in our Inventory of Space-Vehicles on August 28, 1959.)

These sub-orbital launchings will be regarded as proving flights for the final Mercury space-capsule and the men themselves; also a test of the ability of the U.S. Navy quickly to locate and recover the descended capsules. Preliminary tests of "boiler-plate" models of the one-ton capsule have already been made with monkeys as passengers, using Little Joe rocket boosters.

Attempts to place the first Mercury capsule in a low-altitude orbit will be made next year, if all goes well. The vehicle is expected to make three orbits of the Earth before being brought down by parachute in the Atlantic Ocean off the coast of Florida. Modified Atlas ICBMs will be used as launching vehicles.

However, before a man goes into orbit, several "dummy runs" are anticipated, first with capsules unoccupied and then probably with a chimpanzee.

Giving information of the sub-orbital Mercury test programme, Dr. Glennan was appearing before a Congressional Committee charged with considering the American space-budget. NASA has already requested £286 million for its programmes in the 12 months starting on July 31.

Outlining future objectives, Dr. Glennan said that another attempt would be made to send a 375-lb. probe to the Moon, sometime after April 1.

Speaking of Soviet space-supremacy, he thought that improved versions of the Atlas rocket might enable the U.S. to match Russian capability within 12 to 18 months. It was clear that Russia, with more powerful and more reliable boosters, continued to hold a substantial lead in the eyes of the World. In all other respects, however, the United States had an equal capability and had already achieved results in space of perhaps greater significance.

The greatest present need was for "a big increase in funds this year" to speed the development of the 1.5-million-lb.s.t. Saturn booster.

Bull's-eye Shooting

COMMENTING on the successful test of the new Soviet space-booster on January 20, the distinguished Soviet astronomer, Ari Sternfeld, said that the final stage must have reached a height of 770 miles. This was greater than the apogee of Sputnik I (588 miles) although the final stage was only a dummy which contributed nothing to the vehicle's performance.

The accuracy of the rocket was remarkable, he said. It was equivalent to a rifleman hitting the core of an apple at a distance of six miles. Aimed at the Moon, the rocket would have landed within a radius of 30 to 37 miles of the target point.

To secure this accuracy, it was necessary to control the rocket's speed to an accuracy of three-thousandths of one per cent.—i.e., within less than eight inches per second compared with its total speed of 4.5 miles/sec.

The angle of departure had to be accurate within a second of arc, said Sternfeld.

Writing in *Moscow Pravda*, Prof. V. V. Dobronravov states that the Soviet test rocket carried a model of the final stage which, after the conclusion of current trials, will lift a package of instruments into outer space for further research. The success of the nose-cone in re-entering the atmosphere is of paramount importance "for further work on retrievable Earth satellites."

Hiking into Space

SIX experiments to be carried out in the first joint U.S./U.K. Earth satellite, expected to be launched by the Chance Vought Scout in late 1961, were informally agreed between scientists of Britain and the United States meeting in Washington last month. The following experiments will be undertaken:—

Ion and electron studies by probes to measure electron temperature and concentration, and ion mass spectrum; electron density measurements; solar radiation studies; and primary cosmic radiation measurements.

Representatives of the United Kingdom in the joint discussions were: Prof. H. S. W. Massey, chairman of the British National Committee on Space Research; Dr. A. P. Willmore, Department of Physics, University College, London; and Dr. H. Elliot, Department of Physics, Imperial College, London.

Satellite No. 2 may include an experiment devised by Manchester University to extend radio-telescope observations, normally prohibited by the ionosphere, into the medium and long wavelengths. A special radio-receiver has been devised by Dr. R. C. Jennison to operate in conjunction with two metal tape aerials which may extend 50 ft. on either side of the satellite, once in orbit.

It is hoped to test prototype equipment of this kind in a Black Knight rocket to be fired at Woomera later this year.

Another proposed experiment concerns a novel micrometeorite detector which consists of thin sheets of aluminium foil renewed automatically every 24 hr. As each sheet is perforated with small holes, sunlight will be allowed to penetrate on to a photo-sensitive strip of material, thus giving rise to a series of electrical pulses indicating the size of each random particle.

Personal Flying

SWEPT CESSNA.—The new Cessna 210, with its swept fin and rudder sets the style for all the 1960 Cessna range, except the two-seat Model 150 and the 180. The 210 is the first single-engine Cessna to have a retractable undercarriage.

CAPT. BROOKS of the USAF has been kind enough to send us the official publication of the U.S. Experimental Aircraft Association describing its 1959 "Fly-In." The E.A.A. corresponds approximately to our own P.F.A. in being the organization of amateur constructors, but, like everything else across the Atlantic, is rather larger.

The "Fly-In" was held last summer at Greater Rockford, Ill., with the co-operation of Ozark Airlines and the local civic authorities. Among the 1,400 or so participants were such names as Dr. August Raspet, Mr. Fred Weick, Col. Roscoe Turner, Steve Wittman, Ray Stits and Igor Bensen, several of whom spoke on amateur design and construction.

Despite bad weather for the first part of the week-end, 80 aircraft arrived for the "Fly-In," and represented a remarkable variety of home-built and vintage types. Officially classified among the "antiques" was a D.H. 82C Tiger Moth, which was flown all the way from Summerside, Prince Edward Island, by its proud R.C.A.F. padre-owner. Our flying clubs may like to be reminded that this museum piece, which aroused much interest in the United States as a representative of a bygone age, was a later production variant than was ever seen in this country, with a coupé canopy, brakes and tailwheel.

The list of home-builts included many Baby Aces, Wittman Tailwinds and Cougars, and Stits Playboys, as well as such oddities as Pietenpols, a Rose-Parakeet, and (for the U.S.) a Druine Turbulent. Vintage types included a Cessna Airmaster, Waco and Great Lakes biplanes, a Ryan ST-A, a Curtiss-Wright Junior and the rather larger C.W. A-22 ex-fighter-trainer.

Although we might not be able to produce such variety from our amateur constructors in this country, we might well share the sentiments of our U.S. colleagues, who summed up the meeting thus: "What we are all looking for is an aerial knock-about which is really easy to build, truly cheap to build, really big enough to haul a couple of pals into the blue, unquestionably tough enough to operate off the hayfields, and really slow and forgiving enough to be capably flown by the fellow who has fifteen hours of solo time on a production lightplane."

• • •

The Association of British Aero Clubs and Centres tells us that it has produced a Club Members' Tie. This is a "Motif" Tie consisting of the Association's badge, surmounted by an astral crown, on a navy blue background. The two birds of the badge are in silver on a light blue surround, and the crown and garter are in old gold. The tie is made of extremely good quality Terylene.

This tie is apparently very popular and since it was introduced at the beginning of December last year, 45 dozen have been distributed to Member Clubs.

During December, Clubs and Groups admitted to Membership of the Association included the Alpha Mike Flying Group; Elliott Sports and Social Club; Severn Lamb Flying Group; and Stoke-on-Trent Flying Club.

• • •

From past experience, nobody among the aeronautical fraternity was surprised by the £200 fine inflicted last week on Robert Bell, the pilot who inadvertently flew his Messenger into the London Airport circuit under instrument conditions. The sequence of events which led to this incident has been universally condemned by all flying people, but the savage nature of the fine is considered by many to reflect the real official attitude to personal flying.

Bell was indicted for operating the aircraft in a reckless manner, so as to endanger life or property. It was said by Mr. F. E. Beezley, the M.o.A. prosecutor, that 10 aircraft were prevented from landing. A Boeing 707 was held up for six minutes and other aircraft were delayed from 3½ to 27 minutes. The London Airport controller was faced with a very difficult situation. There was an aircraft about which he knew nothing, which had no right to be there, and had no lights.

The situation was undoubtedly full of potential hazard, but in fact no one was injured or suffered more than minor inconvenience. The delay to other aircraft might have been substantially reduced if the Messenger had been talked down for an immediate landing at L.A.P., instead of passed from one airfield to another. It is fortunate that nothing worse resulted from the incident, but in passing it is interesting to compare the punishment with that inflicted for far more serious cases of dangerous driving.

One of the most disquieting features of the case which went largely unnoticed was that Bell was the holder of only a student pilot's licence. All his flights should therefore have been supervised by a flying instructor, and he certainly should not have carried a passenger. With proper supervision, he should not have got into the position that he did.

Gliding Notes

by Dr. A. E. Slater

TED STARK, who organized the meeting for the Army Gliding Association, made an interesting flight of 74 miles in a series of waves on December 30. In a Skylark 2, he was first towed from Shawbury to the Clwydian Range in North Wales, released, and rose to 8,300 ft. in its first lee wave.

His next wave, over Ternhill, gave him 9,300 ft. This was not the top of the wave, but the wind higher up was too strong for him to keep station without losing height.

More wave lift appeared over Wellington, Cannock, Lichfield and just before Derby, where things got murky. As Derby Airport gave him a green light, he accepted the invitation and found, as many glider pilots have found before when landing at airfields, that no power-flying had been attempted in the dangerously strong wind.

On the same day Colin Horsfall took the Avro Gliding Club's Skylark 2 6,000 ft. vertically and 60 miles horizontally.

• • •

AT the annual party of the Crown Agents' Gliding Club on January 18, the chairman announced what he called the club's vital statistics: 22 (flying members, home and overseas), 42 (associate members), 717 (flights in 1959). Cross-country flights for the year covered 491 "air miles"—but he must have meant ground miles.

The full title used to be "Crown Agents for the Colonies" when the club was formed, but it is now "Crown Agents for Oversea Governments and Administrations." However, none of these territories contributed to the large selection of cheeses which is a feature of this club's annual parties.

• • •

AN additional club is joining in the second National Gliding Week from July 24 to August 1, so there will be competitions then at four clubs: London, Yorkshire, Derbyshire and Lancashire and Coventry. It seems likely, but is not yet certain, that the Inter-Services Championships will be held in the same period, and that in the previous week, beginning July 16, the Championships of the R.A.F. Gliding and Soaring Association will be held; but they have not yet found a site.

Correspondence

Put the Onus on the A.R.B.

I AM concerned with the relation between the small aircraft producing and maintaining companies and the Air Registration Board. A small company can be in a position to build or modify light aircraft in a perfectly satisfactory fashion, yet nearly always the major expense is involved in obtaining clearance from the A.R.B., particularly if design clearance is required.

The design is always assumed unsafe until the company proves it otherwise—a system quite satisfactory where a large organization can back the design, but the proving can be prohibitively expensive to a small company, unless the A.R.B. is actively helpful, which is not usually the case.

Now look at the position of the A.R.B. surveyor: if he turns down all or part of the design as uncertain, he loses nothing, if he clears it, however, he takes on himself the responsibility for its safety. Thus the scales are weighted against the designer. Surely the system is faulty in placing the surveyor in this position.

From the designer's point of view, the onus should be placed on the A.R.B. to prove the design unsafe, or clear it, in a reasonable time after submission for clearance. In this case, a scale of clearance cost could vary as speed and weight for a complete aircraft, or fractions of this for a major or minor modification.

Leicester. D. WOODWARD.

Forbears of B.O.A.C.

IT isn't often I find fault, and when I do I often refrain from comment, but—

Page 623 of your December 18 issue describes B.O.A.C. as "formerly Imperial Airways." I respectfully submit this is a pretty bad brick to drop. B.O.A.C. was born of the Cadman Committee of Enquiry into Civil Aviation. "Formerly" it just did not exist.

This all took place about 21 years ago and if the younger generation sees these sort of errors repeated once or twice, it will accept them for fact, which would be a great disservice to aviation history.

Surely there is someone on your staff who can remember Imperial Airways, Hillman Airways, Railway Air Services, Spartan Airlines, British Continental Airways, British Airways, Crilly Airways; and there were others, none of them Government monopolies, and all fired by the spirit of free enterprise and all, in their way, pioneering!

London, S.W.1. "MUSKETEER."

[Our correspondent is quite right in principle. B.O.A.C. was a new organization, but it consisted, in practical fact, of Imperial Airways and British Airways. Of our correspondent's list, Hillman Airways, Spartan Airlines and British Continental Airways can (through British Airways) be considered to have been among the ancestors of the Corporation.—ED.]

The Airspeed Ferries

IN a recent issue of THE AEROPLANE AND ASTRONAUTICS, comment was made on the engineering background and business life of the late Nevil Shute Norway. In this connection I enclose a small photo—which hasn't to my knowledge been previously published and which may interest your readers—showing his small aircraft firm, Airspeed, Ltd., then in an ex-bus garage at Piccadilly, York, in 1932. In the picture can be seen the first Airspeed Ferry destined for Alan (now Sir Alan) Cobham's flying circus.

At the top left-hand corner of the picture can be seen the nose portion of one of the Tern gliders, swung up in the roof girders. The entire works personnel at that time numbered around 30 and test flying called for the dismantled Ferry to be towed, late at night, to Sherburn-in-Elmet aerodrome, where it was re-erected in a tumble-down hangar during some appalling Yorkshire wintry weather. I wonder where the Ferries were pensioned off?

Gloucester. L. MORGAN.

A Non-flam Fluid ?

A LEADING article in your issue of Jan. 22 deals with the subject of hydraulic systems in relation to fire risk. But I rather think too little emphasis was placed on the very real hazards of inflammable fluids at high pressure.

As one who has been concerned with the design of hydraulic systems I feel strongly about this. One alarming and perhaps less obvious aspect is that even if electrics and hydraulics are widely separated (which is not always possible), a small leak at high pressure from a faulty connection or a split pipe can rapidly fill the bay with explosive vapour. Then if there is any sparking in the neighbourhood a catastrophic explosion could occur.

A standardized non-flam fluid with a wide temperature range is greatly to be desired.

Cheltenham. KENNETH J. KEY.

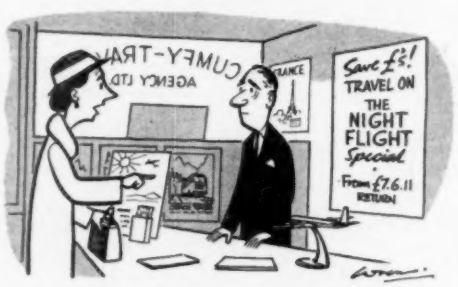
Groundabout

Achievement. Among the recent triumphant statistics which have taken me slightly aback, I rather like the one which goes "Every 7.3 seconds another flying hour is logged by a Rolls-Royce civil gas turbine." This remarkable engine seems to have something in common with an unfortunate character in America where, according to reports, "a man is murdered every twelve minutes."

✱

The Sandys of Time. The cut-backs in military contracts which most of us lookers-on had thought to be verging on the catastrophic was, it seems, just what the industry had wanted for years. As one chief executive has put it, "The reduction in military business leaves us more free to grasp and develop the opportunities offered in the military field."

✱



"I suppose you don't have any night flights during the day?"

✱

Darkest Hour. At an American airport a traveller asked a negro employee if a certain flight was still available. When told it had been cancelled, the traveller refused to believe his informant and turning to the airline's traffic officer who happened to be passing, asked him and got the same sad news. "Well, sah," said the negro, "now you have it in black and white."

✱

Game Type. Did you hear of the novice pilot who was explaining to his C.F.I. why he hadn't brought back his aeroplane? "Approaching the village, my prop. flew off, making the engine race and shake itself out—then my port wing struck the steeple, swinging me on to the main road—my tail was torn off by the telegraph wires and I skidded upside down across the road into a shop window—at this point I lost control. . . ."

by Gresham

Industry Record

Non-destructive Testing

An agreement has been concluded between Kelvin and Hughes, Ltd., and the Curtiss-Wright Corpn. of America for the exclusive right to manufacture and sell the non-destructive testing equipment of the other partner. This includes instruments for the inspection and measurement of materials, and equipment employing ultrasonic techniques in all industrial fields. Kelvin and Hughes will represent both interests in the U.K., the Commonwealth (except Canada) and Europe, and Curtiss-Wright will be the agent in North America.

Crash Tender for Russia

The Pyrene Co., Ltd., has supplied one of its Mark 6T airfield crash tenders to Russia. It was ordered by the U.S.S.R. Trade Delegation in the United Kingdom.

Built on a Thornycroft 6 x 6 chassis, this tender is powered by a 200-b.h.p. Rolls-Royce petrol engine. As specified by the Soviet Trade Delegation, the tender carries 800 Imp. gal. of water, 90 Imp. gal. of foam compound, four 50-lb. CO_2 cylinders and one hose reel.

A foam output of approximately 5,000 Imp. g.p.m. for more than two minutes is provided by the monitor on the cab roof, operating in conjunction with the two hose lines carried. The tender is designed to take in additional supplies of water and foam compound during operation, without breaking the continuity of foam production.

The vehicle is also capable of delivering high-pressure water jets for general fire-fighting purposes. Enclosed accommodation is provided for a crew of five.

Welded Engine Construction

The Argonarc welding process, employing equipment manufactured by British Oxygen Gases, Ltd., is now extensively used in the construction of turbojet engines. Two examples of the use of this process can be found in the Bristol Siddeley Orpheus and Sapphire.

In the turbine stage of the Orpheus, hollow stator blades of Nimonic 90 heat-resisting alloy are assembled in seven disc segments. Individual blades in each segment are Argonarc welded at the roots, attaching them to the outer disc section. Welding of the blade tips to the inner disc section then follows. The welded sub-assemblies are attached to the rear of the combustion chambers so that on final assembly they form a complete annular stator stage of the engine.

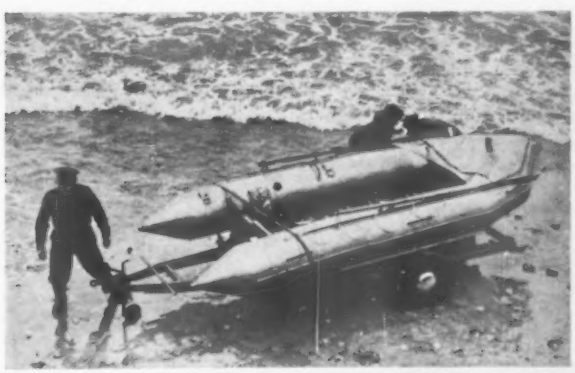
Stainless steel pipes for the Sapphire are fabricated as a number of (up to six) shell sections before being Argonarc welded into cylindrical assemblies. As the wall thickness of many of the pipes does not exceed 26 s.w.g. careful preparation for butt welding is essential. Sections are held in position by tack welds and the pipes are filled with argon during the main welding operation to ensure good results.

Stator blades for the Orpheus turbojet being positioned before welding, by the Argonarc process, to the disc segments which complete the sub-assembly.

New Aluminium Company

The Delta Metal Co., Ltd., has formed a new company, James Booth Aluminium, Ltd., to acquire the whole of the aluminium and light-alloy interests of its existing subsidiary, James Booth and Co., Ltd. The new company will have an issued capital of £10 million of which Delta will contribute £5 million by way of existing assets, and Kaiser Aluminium and Chemical Corpn. £5 million by way of additional finance.

Existing Delta assets include the Kitts



SOMETHING NEW IN RESCUE CRAFT

Recently demonstrated at Newquay, the R.F.D. Zodiac air-sea rescue unit comprises an inflatable boat powered by an 18-35-h.p. Evenrude or Johnson outboard engine, a 20-person inflatable liferaft, and a trailer. Two types of liferaft are available—the new Zodiac rescue craft, or a double-chamber circular raft. The powered boat measures 15 ft. overall with a 6-ft. beam and weighs 230 lb. without engine; the Zodiac liferaft is 17 ft. long by 6 ft. 10 in. beam and weighs 150 lb.

Photographs copyright "The Aeroplane and Astronautics"

Industry Record . . . .

Green Works, Birmingham, and the 12,000-ton forging press at the Halberton Street Works of James Booth and Co. The new finance being provided by Kaiser will be used in re-equipping the Kitts Green Works and for the installation of new rolling equipment for the production of sheet, strip and plate in pure aluminium and soft aluminium alloys.

This will be an entirely new development for James Booth, which has hitherto specialized in the strong aluminium alloys such as Duralumin and Dural for the aircraft industry. The management of the new company will remain in the hands of the Delta Group.

Ground Handling

A two-way agreement is at present being negotiated by Auto Diesels, Ltd., of Uxbridge, with the Air Logistics Corpn., of Pasadena, California. Under this agreement, the American company will use the Auto Diesel Aydee gas-turbine air starter in its Model 10,000 Pilot Tug, and Auto Diesels will build this aircraft tug under licence in this country.

Processing Merger

Roto-Finish, Ltd., of Hemel Hempstead, specialists in all types of finishing processes for the metal and plastics industries, have acquired a substantial interest in N. V. Roto-Finish Maatschappij, Delft, Holland, a company which is engaged in similar business in the Benelux countries. The sales programmes and the service organizations of the two companies will be integrated.

U.S. in Italy

Hamilton Standard, a division of the United Aircraft Corporation, has completed negotiations leading to the purchase of a 50% interest in Microtecnica, Inc., of Turin, Italy. Microtecnica has been in existence in Turin since 1928 and was founded to manufacture electromechanical devices. Its main products are marine and aviation navigation instruments, optical and mechanical testing instruments, servo-mechanisms and synchro-mechanisms.

Warning Lamp

A recent addition to the range of equipment produced by Dowty Nucleonics, Ltd., Aircraft Electrics Division, is a press-to-test warning lamp. Equally suitable for industrial or aircraft use, the unit incorporates built-in facilities for dimming, and for lamp filament checking. Interchangeable with earlier approved types of warning lamps and electromagnetic indicators, it can be installed from the front of the mounting panel.

Radio Astronomy

Blackburn Electronics, Ltd., has received an order for a data logger for use in conjunction with the Jodrell Bank radio telescope. Signals received by the telescope will be recorded by the data logger and the information on punched paper tape transmitted to a digital computer. This equipment is thought to be the first of its kind ever to be used for this purpose.

Service from English Electric

In order to improve liaison between its Aircraft Equipment Division, at Bradford, and aircraft and aero-engine constructors, English Electric has formed a new project engineering group. Mr. T. E. Simms, chief project engineer, is to be in charge of the group, which will now be responsible for all the technical co-ordination required—both internally and externally—on any contract. The company explains that a very high degree of co-ordination is needed between the Aircraft Equipment Division and its customers "because of the ever-increasing complexity of the electrical systems."

This General Electric galley for an R.A.F. Transport Command Britannia forms part of the display on the Royal Air Force stand at the Hotel and Catering Exhibition at Olympia.

Gearbox for Canada

A speed increasing gearbox of special design has recently been completed by A.E.I. Heavy Plant Division and shipped to Canada. The gearbox was supplied through A.E.I. (Canada), Ltd., and is for the Canadian Pratt & Whitney Aircraft Co., Montreal, who will use it for aircraft gas-turbine development work. It transmits 2,000 h.p. with a speed increasing ratio of 1,700/44,840 r.p.m.

Aviation Calendar

February 5.—Helic. Assn. of Gt. Britain lecture, "Helicopter Operations of New York Airways," by R. L. Cummings, Jnr., in the Library, 4 Hamilton Place, **London**, W.1, at 18.00 hrs.

February 8.—Institute of Transport Brancker Memorial Lecture, "R.A.F. Transport Command," by Air Chief Marshal Sir Denis H. F. Barnett, at Jarvis Hall, 66 Portland Place, **London**, W.1, at 17.45 hrs.

February 8.—R.Ae.S. Henlow Branch lecture, "Strategic Air Command," by a member of the 7th Air Division, U.S.A.F., at the Assembly Hall, R.A.F. Technical College, **Henlow**, at 19.45 hrs.

February 8.—R.Ae.S. lecture, "Model Testing in the Aircraft Research Association Co-operative Wind Tunnels," by E. D. Carter, in the Library, 4 Hamilton Place, **London**, W.1, at 19.00 hrs.

February 9.—R.Ae.S. Cambridge Branch lecture, "The Development of Rotodyne," by Dr. G. S. Hislop, in No. 1 Lecture Hall, **Cambridge** University Engineering Laboratories, at 20.15 hrs.

February 10.—British Institution of Radio Engineers, Newcastle upon Tyne lecture, "Instrumentation in Rocket Propulsion," by R. E. Ross, at the Institution of Mining and Mechanical Engineers, Neville Hall, Westgate Road, **Newcastle upon Tyne**, at 18.00 hrs.

February 10.—R.Ae.S. Chester Branch lecture, "Bitumen and its Application to Runways," by G. P. Jackson, in the Lecture Theatre, Grosvenor Museum, **Chester**, at 19.30 hrs.

February 11.—R.Ae.S. Cheltenham Branch lecture, "Some problems of Satellites for Scientific Purposes," by Dr. A. W. Lines, at St. Mary's College, **Cheltenham**, at 19.30 hrs.

February 12.—R.Ae.S. Agricultural Aviation Group lecture, "Choice of Aerial Vehicle," by N. D. Norman and T. Clutterbuck, in the Library, 4 Hamilton Place, **London**, W.1, at 19.00 hrs.

February 15.—R.Ae.S. Derby Branch lecture, "The Use of Rockets in Scientific Research," by Prof. H. S. W. Massey, at Rolls-Royce Welfare Hall, Nightingale Road, **Derby**, at 18.15 hrs.

February 15.—R.Ae.S. Halton Branch lecture, "Parachutes," by S. B. Jackson, at the Branch H.Q., **R.A.F. Halton**, at 18.45 hrs.

Company Notices

NEW COMPANIES

Aviation, Marine and Industrial Exports, Ltd. (646,822).—Private co. Reg. January 13. Cap. £1,000 in £1 shs. Objects: To carry on the business of engineers and contractors, agents for the exportation, importation, purchase and sale of aircraft, boats, etc. Directors: Thomas G. Mapplebeck, 64 Avenue Clemenceau, Beirut, Lebanon; Francis C. de la Poer Beresford-Peirse, Flat D, 1 Morpeth Terrace, S.W.1.; Bruce M. Sidwell, 64 Avenue Clemenceau, Beirut, Lebanon. Sec.: F. C. de la Poer Beresford-Peirse. Reg. off.: Dacre House, Victoria Street, Westminster, S.W.1.

E.B. Engineering Co., Ltd. (646,690).—Private co. Reg. January 11. Cap. £2,000 in £1 shs. Objects: To carry on the business of manufacturers of and dealers in motorcar and aeroplane accessories and component parts, etc. Directors: Albert Wright and Leonard J. Barnes, both of White House, Main Road, Earls Barton, Northants. Sec.: Florence I. Wright. Reg. off.: White House, Main Road, Earls Barton, Northants.

New Patents

APPLICATIONS ACCEPTED

830,537.—**Morrow, E. F.**—"Releasable connection."—Sept. 25, 1957 (Oct. 4, 1956).

830,520.—**Eddie, W. L.**—"Aircraft."—Dec. 10, 1957 (Sept. 10, 1956).

830,686.—**Communications Patents, Ltd.**—"Tactical control training apparatus."—March 29, 1956.

830,556.—**Etudes et Fabrications Aeronautiques.**—"Equipment comprising a parachute container and static line."—Apr. 2, 1958 (Apr. 4, 1957).

830,557.—**General Electric Co.**—"Apparatus for producing arc plasma at high speeds."—Apr. 2, 1958 (Apr. 8, 1957).

Printed specifications of the above will be available on March 16, 1960, and the opposition period will expire on June 16, 1960.

Personal Notices

BIRTHS

Briggs.—On January 25, to Catherine (*née* Bray), wife of Flt. Lt. K. R. Briggs, of R.A.F., Cranwell—a son.

Crawford.—On January 24, at the Princess Louise Margaret Hospital, Aldershot, to Gwyneth (*née* Heap), wife of Wg. Cdr. W. A. Crawford—a son.

Dark.—On January 18, at Maryhill Maternity Hospital, Elgin, to Ann (*née* Thompson), wife of Flt. Lt. M. E. Dark—a son.

Evans.—On January 12, at R.A.F. Valley, to Flt. Lt. and Mrs. M. E. S. Evans—a daughter.

King.—On January 23, at R.A.F. Hospital, Ely, to Patricia (*née* Jones), wife of Flg. Off. Colin King—a son.

Hayward.—On January 21, at the R.A.F. Hospital, Nocton Hall, to Beryl (*née* Drummond), wife of Flt. Lt. V. F. Hayward—a daughter.

Maynard.—On January 23, at St. Andrews, Fife, to Mollie, wife of Sqn. Ldr. L. C. Maynard—a son.

Parsons.—On January 5, at Moreton-in-Marsh, to Maureen (*née* Reynolds), wife of Flt. Lt. T. Parsons—a son.

Richmond.—On January 15, at Wroughton R.A.F. Hospital, to Betty (*née* Moore), wife of Flt. Lt. K. A. Richmond—a daughter.

MARRIAGE

Eekhout—Weir.—On January 14, at Saxmundham, Suffolk, Flt. Lt. A. W. Eekhout, R.A.F. (retd.), to Rosamond Suzanne, widow of Major T. J. C. Weir, M.C.

DEATHS

Bedford.—On January 16, at Salisbury General Hospital, Gp. Capt. Frank Henry Bedford, C.B.E., M.C., M.M., R.A.F. (retd.).

Chick.—On January 21, Air Cdre. Johnnie Chick, M.C., A.F.C., of Hawkley, 10 Victoria Road, Colchester.

Lewis.—On January 22, Gp. Capt. Evan Christopher Lewis, R.A.F. (retd.), of Berwick Court, East Sussex

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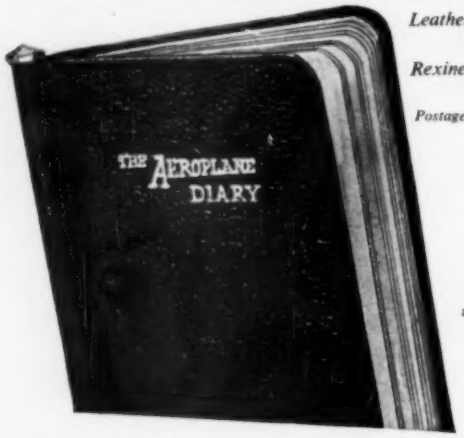
THE AEROPLANE DIARY, 1960

Now available, the 1960 edition of this popular Diary contains a wealth of useful reference material for all who are interested in aviation and astronautics. New features this year include a Data Section on British Missiles and Rockets, a 4-page record of Milestones in Rocketry and Astronautics, and photographs of 28 of the latest types of British aircraft reproduced in gravure. Other sections in this information-packed Diary include Specifications of all British military and civil aircraft, World Flying Records, a summary of R.A.F. Commands, the I.C.A.O. Phonetic Alphabet, a directory of Aircraft and Engine Constructors, a Table of Airline Distances and a Mach Number Chart. 1960 *Edition* 4¼ *in.* × 2¾ *in.* 79 *pages.* 34 *illustrations.*



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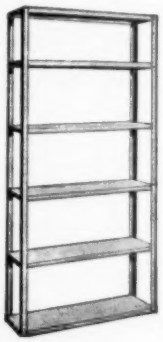

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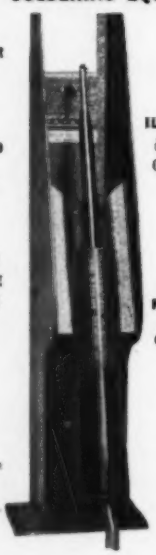

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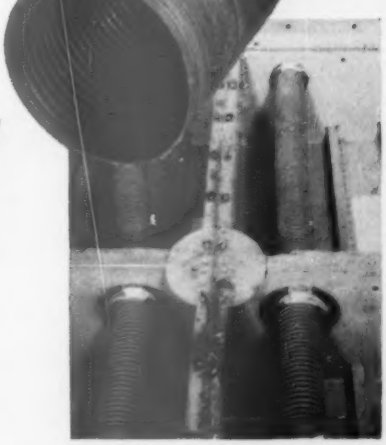

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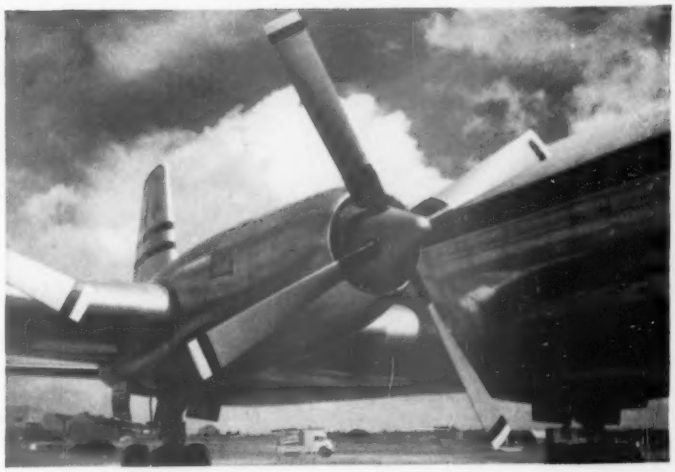

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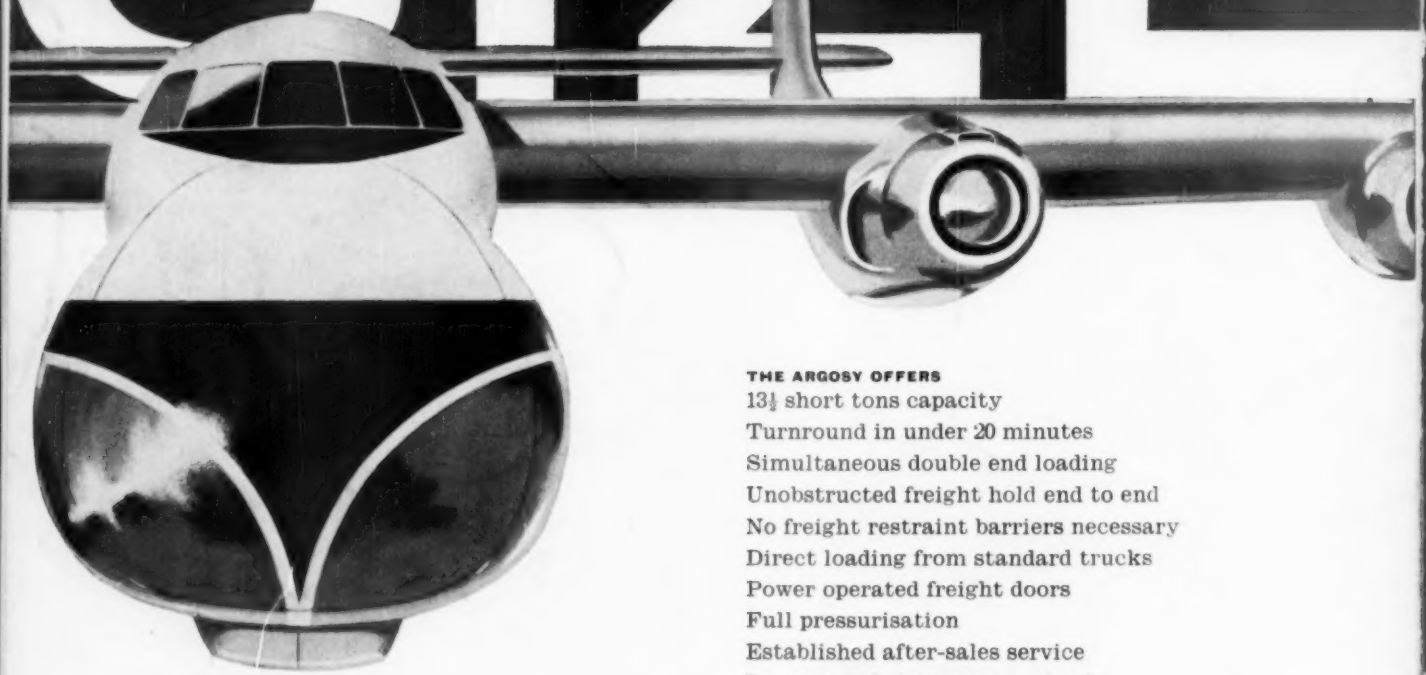

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A.W.A. ROLAMAT LOADING SYSTEM:

This rapid loading system has been used in many countries on route operations. It has a low weight penalty and suits any standard truck. With the Rolamat two men can load two tons of bulky cargo — such as a spare engine — in under ten seconds.

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